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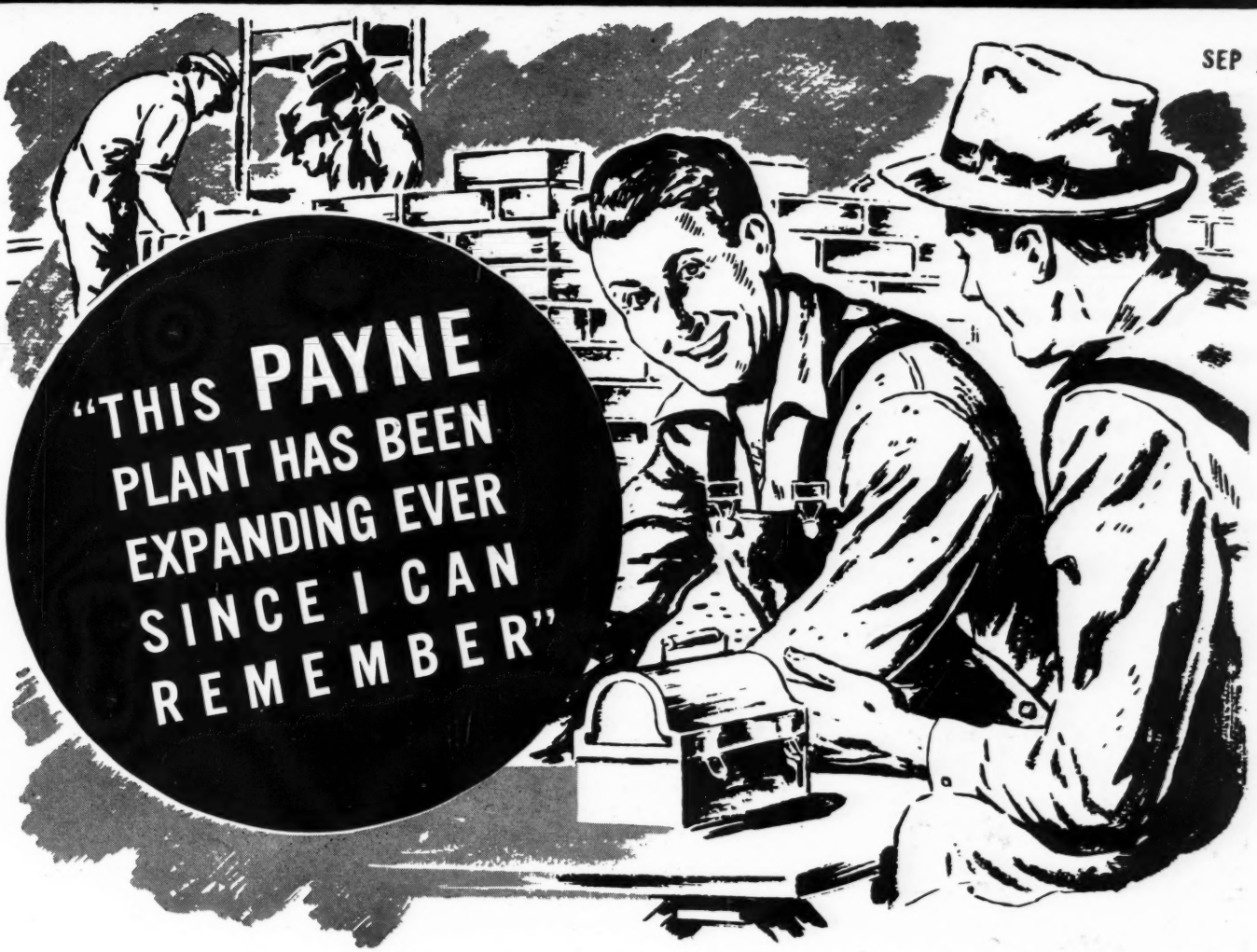

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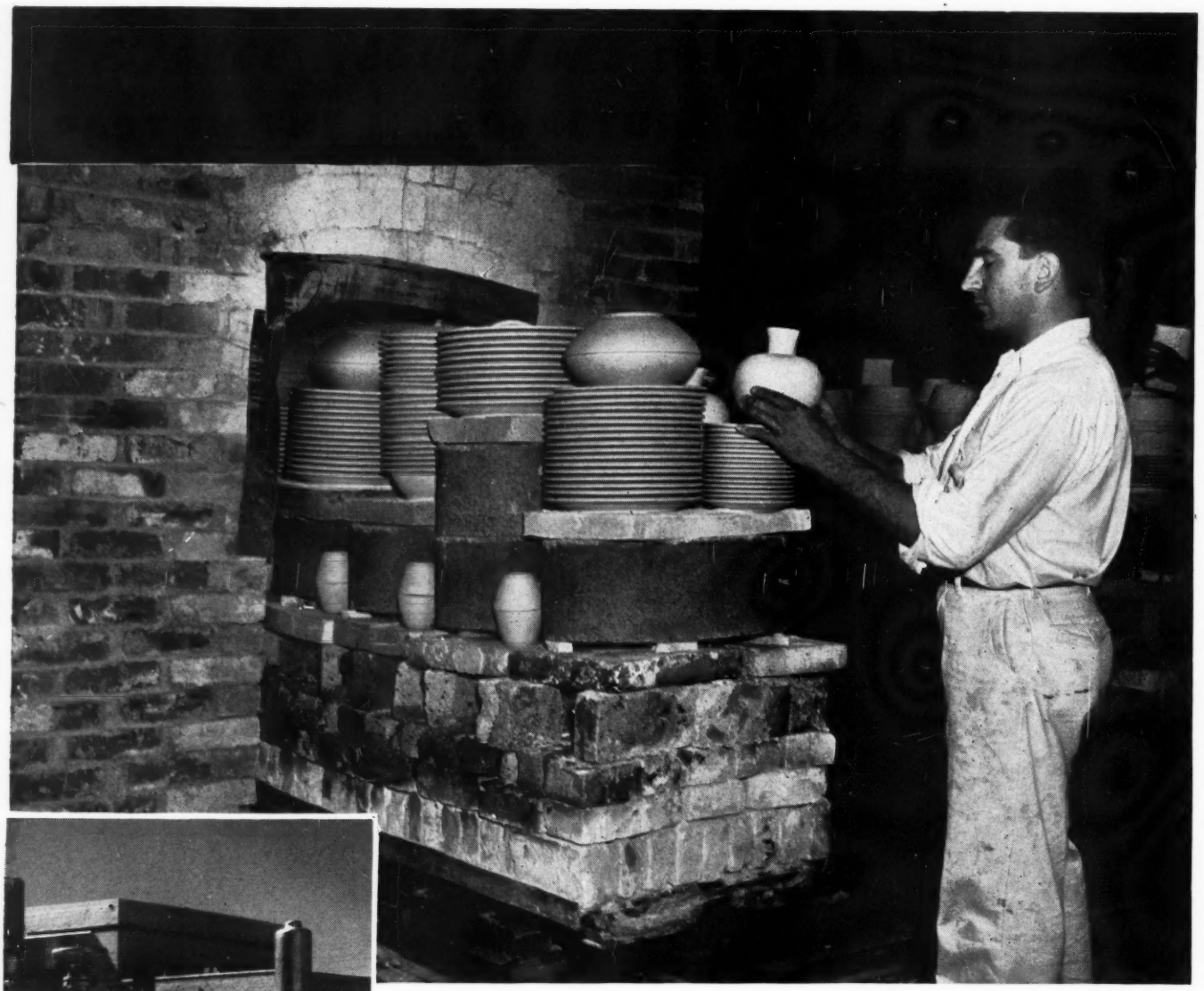

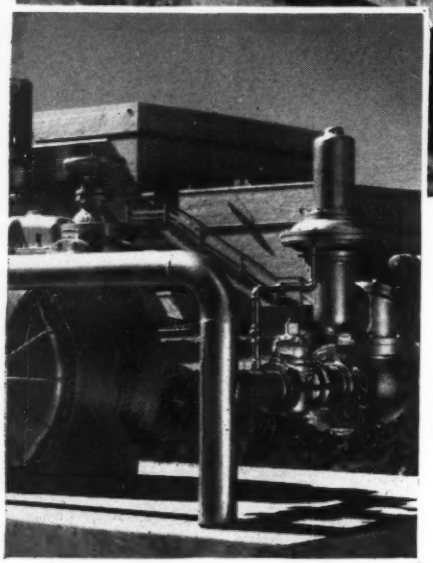

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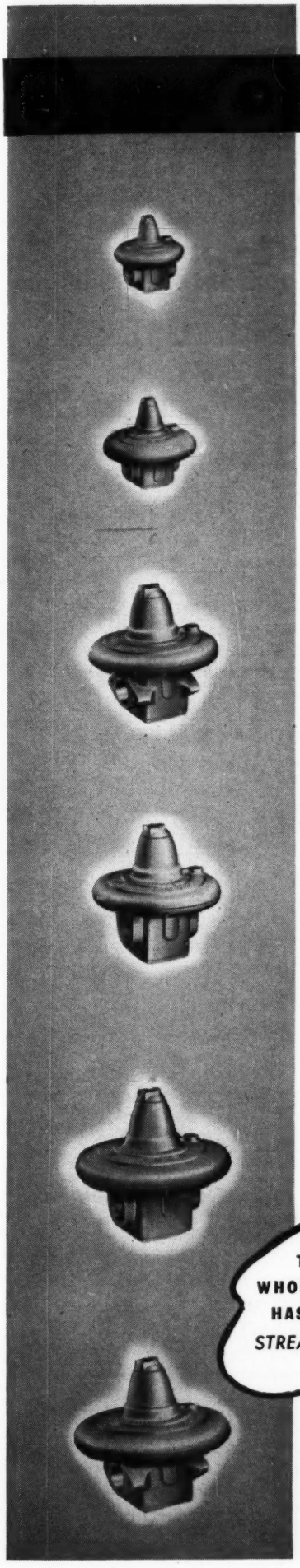

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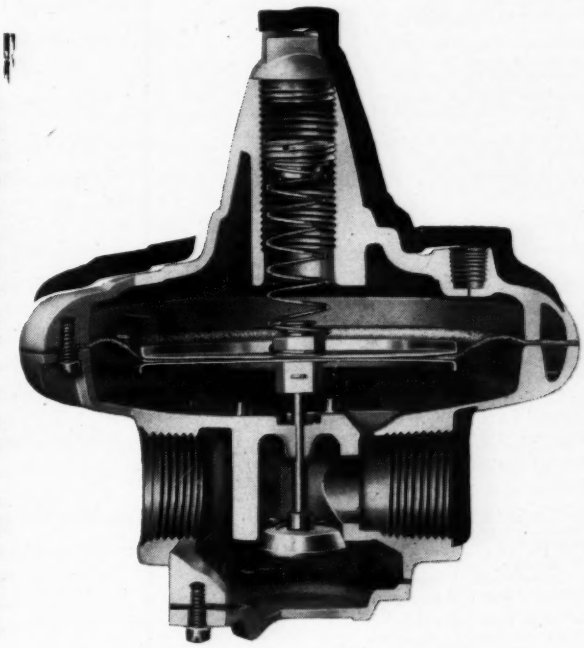

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Twenty-Second Year of Publication

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Publication Office

LOS ANGELES 14, California, 1709 West Eighth Street, DRexel 4337.

Branch Offices

DAVID CARMEN, Manager, **CHICAGO 3,** 1064 Peoples Gas Building, WABash 2589

L. V. HOHL, Manager, **NEW YORK 17,** 50 E. 42nd Street, MUrray Hill 2-4504

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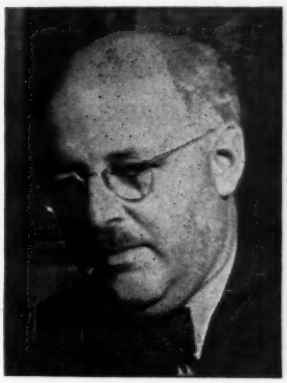
THERMALLY THINKING

By ELLIOTT TAYLOR, Editorial Director



War Babies Weaken

PLAYING a hunch that has been sneaking up on sales managers for several months, a number of manufacturers of electrical appliances ranging all the way from table top convenience gadgetry to ranges and refrigerators have begun checking up on the authenticity of the so-called backlog of consumer demand left over by the war.

Manufacturers wanting to know how much demand would survive the first heavy buying wave decided to try it out by actual trial. Certain cities and certain areas have been shipped enough of the appliance being tested to supply all of the normal call without flooding the market. Confronted with the invitation to come and get it, the buying public has shown reactions that are interesting and significant.

The findings, reported in more detail on Page 47 of this issue of GAS, seem to substantiate the warning, already voiced by more than one manufacturer of gas appliances, that the market can change almost overnight from a seller-dominated to a buyer-controlled situation. In the main it is evident that the larger and more significant purchases have a longer lasting attraction to the buyer, a factor that is favorable to the outlook for gas appliances.

For such mechanical trivia as toasters, electric broilers, table radios and warming pads it now appears that the demand has been more casual than actual. People with plenty of money to spend just "think it would be nice to have"—any one of a number of household adjuncts or adornments; but once the hot top layer of their bankroll has been peeled off, the buying fever in the balance subsides rapidly. Thus it appears that many of the millions of prospects for electrical goods don't really want an electric toaster *and* a warming pad *and* a radio, but rather they will buy an electric toaster *or* a warming pad *or* a radio.

A World of Difference

Between the demand that is satisfied by just spending for whatever comes along, and the market represented by those who know what they want and will wait until they can get it, there is a world of difference.

The gas appliance industry is fortunate in that a high percentage of its demand is for major appliances for which those who are now waiting will continue to wait until they can get what they want. But the fact that a stove customer will wait for a stove does not mean that he will wait indefinitely for his favorite make of gas range, or even that he will wait for a gas range if the electrical industry gets to him first with attractive merchandise and appealing rates.

Another trend uncovered by the survey may prove to be more of a plague than a blessing to the gas utilities. It has been discovered that the war babies, the great Who-is-it Industries that have been dumping hastily cobbled up equipment of unknown parentage and doubtful value on the market, are already on the way out. The buying public has apparently become brand-conscious again, with the result that the overpriced and poorly engineered items that moved quickly at fantastic prices, practically free of OPA control, are now going begging. Householders and homemakers now prefer to wait for the appearance of the old and trusted names on the merchandise they will invest their money in.

This trend promises a just reward as well as a vindication of the vision of all manufacturers who kept on plugging the name and the product even when the only message they had to relay was that no consumer goods were available during wartime.

New Excursions

While the electrical industry is the happy hunting ground for every stamping works of sheet metal shop that wants to take a flier into appliances, the gas appliance field has not been entirely overlooked. Merchandise of doubtful quality backed by names that nobody knows is to be seen on the market today in limited quantities. And there is much more talk about new excursions that makers of other equipment are planning to make into the gas appliance field.

Gas utilities in the main welcome any new factor in the gas equipment field that comes in with a meritorious product, adequately engineered, and tested and backed by a selling program that is designed to enhance the prestige of gas fuel. But they cannot regard with indifference the attempts of a few makers of inferior goods to get in on the first buying wave with cheap merchandise, overpriced and promoted without regard for the continuing obligations of service and replacements that the installation of any major appliance entails.

Demise

The hit and miss maker of electrical gadgetry may come and go; and the power companies, while they may not approve of his tactics, can regard his business demise as being of little lasting significance. The equipment that has been dumped on the market rapidly disintegrates into scrap and the whole matter ends there as far as the utility is concerned. The customer may be either sadder or madder—and perhaps he may even be a little bit wiser—but customers have always been the proving ground for bad ideas as well as good ones, and he is supposed to take his beating as often as he asks for it.

But the gas companies are not in such a detached position with regard to maverick gas appliances that hit the market. Rightly or wrongly, the gas utility has allowed and even encouraged the idea that it is responsible not only for the delivery of the fuel that goes into an appliance, but for the performance and operation of the equipment in customer service. Every orphan gas range or space heater left stranded in operation without servicing or parts replacement facilities will be an added source of expense, and a potential source of bad customer relation to the gas company on whose lines it is operating.

Rigid Precautions

Thus, while the electrical survey indicates that the demand for major appliances is a substantial and real demand—one that will endure until the appliances wanted show up on the market—the gas utilities must exercise the most rigid precautions against encouraging the sale or distribution of merchandise that is not up to the highest standards, and made by companies whose reliability and continued operation in the appliance field is not beyond question.

Carry The Share

New names will of course appear on ranges, on water heaters and on other pieces of gas equipment. No new item should be rejected merely on the grounds that it is a postwar product. But every legitimate manufacturer who goes into gas appliances with the intention of staying in will be prepared to offer not only the merchandise that he makes: he will be prepared to carry his share of the advertising and promotion load that the entire industry has assumed; he will present along with his goods adequate and aggressive sales plans for utilities or appliance dealers or both; and above all he will have built into his line those standards of quality that insure a continuous and successful exploitation of the rich consumer appliance market.

It is in these fundamentals that the interests of the manufacturer, the utility and the appliance dealers become identical. If the findings are being correctly interpreted, and if the prospective buyer of major appliances is willing to wait until he can get the appliance he wants, then it is up to every factor having a stake in either the gas or the gas appliance industry to see to it that what he gets proves to have been worth waiting for.

A Mild Slap

DURING the closing days of the Federal Power Commission's Docket G-580 hearings in Washington, the commission's economic expert, as well as the coal industry's attorney, sought by cross examination of industry witnesses to prove that certain "inflammatory" articles in the oil and gas trade press had contributed to the alarm that the industry felt over the probable reason for the investigation, and the likely deductions that the commission would draw from the evidence that was being gathered.

This line of questioning, as it developed, was a rather mild slap on the editorial wrist at best, but its trend and intent illustrates all too well the obvious distaste that all federal bureaus, including the power commission, feel for any enquiry into its motives. The very questions were in themselves a sort of anachronistic survival of the good old days when Mr. Big sat behind his desk-full of bric-a-brac and boobed reporters who didn't give him and his policies and philosophies a favorable play. They are a survival of the sacred creed developed during the war, under which any critical mention of the sculduggery or machinations of any government agency was regarded as akin to treason. It is only in recent months, and as a result of the smelly investigations of war contracts, that the potential evil of enforced silence and repressed criticism has again been realized.

Hands Full

We believe that the few oil and gas journals that took a positive and unequivocal stand on the investigations did the industries they are serving a considerable service; if they contributed to apprehension over the commission's motives, it was a healthy apprehension; and out of it grew a full presentation of the industries' attitude toward the encroachment of federal regulation into fields not adapted to federal control.

As far as we can see the Federal Power Commission has its hands full right now trying to discharge the responsibilities that have been imposed on it by the Natural Gas act. Before it can devote any appreciable amount of its time or the time of its economists to analyzing the motives of the trade press, it would be well advised to remove itself as far as possible from the sphere of just criticism by performing as expeditiously as it can those functions with which it is charged by law.

Then if the trade press gets too "inflammatory," and if the criticism or comment levelled at the commission becomes false or libelous in nature, it will have ample time and talent available to frame a suitable action against the offenders.

But until that presently improbable course becomes advisable, we believe the commission would do well to refrain from any attempt to discredit those who analyze its activities merely because such analysis is, as it by right ought to be, at times both penetrating and critical.

On Page 29 of this issue, Dr. E. DeGolyer, gas research expert, brings up to date his previous paper on the estimated natural gas reserves. The article was presented at the recent Washington hearing of the Federal Power Commission's natural gas investigation.

Highlights

• Recent publication of the American Gas Association's "Report of Utility Gas Sales" for the first quarter of 1946 inaugurates a new and revised series of gas statistics. Gas utilities sales statistics will henceforth be published in four categories: manufactured gas, natural gas, L-P gas, and mixed gas. By cutting down the number of companies reporting, without materially reducing the customer and revenue coverage surveyed, the A.G.A. expects to achieve a more timely publication of the running figures on industry operations by quarters.

• "Those who favor restrictions (on end use of natural gas) argue that such action would lengthen the life of the natural gas business. In my opinion, closing a few gates on the market ends of pipe lines by end-use restrictions would not save any gas for the future. The owners of the gas land—be they independent producers or pipe line companies—are going to obtain a return on their properties. If not obtained through pipe line transportation, such earnings will be secured through the sale of gas for other uses."

E. Buddrus, president, Panhandle Eastern Pipe Line Co., appearing before the Federal Power Commission.

• Pending its determination of the most economic and desirable means of utilizing the depleted Winterfield and Cranberry Lake gas fields for natural gas storage, the FPC has denied an application filed by Michigan Gas Storage Co., a new company organized to purchase and store natural gas for Consumers Power Co., for a temporary certificate to purchase natural gas from Panhandle Eastern Pipe Line Co., to sell to consumers. To meet the immediate demands of consumers, Panhandle Eastern is authorized to sell the company gas directly at Zilwaukee Junction, and to construct and operate the necessary facilities.

• "Powdered Coal Drives a Revolutionary Engine," in the August "Readers Digest" describes the development of a new powdered coal-burning gas turbine developed at Johns Hopkins University laboratories under the direction of John I. Yellott, formerly chief of the Institute of Gas Technology in Chicago. Railroads and Bituminous Coal Research, Inc. have raised a million dollars in pledges to make the new application a practical reality. Says the article: "Work is progressing on a home furnace to be fed automatically by an air-driven stream of powdered coal."

• New York State Natural Gas Corp. has been authorized by the FPC to purchase for $799,998 in cash all properties and facilities in New York and Pennsylvania owned by Godfrey L. Cabot, Inc., and Cabot Gas Corp., with a few minor exceptions. A new customer will be the Rochester Gas and Electric Corp., a gas utility.

• "The principal items of expense in the construction of pipe line facilities are steel and labor. The others can be disregarded as unimportant or as following the trend of steel and labor costs. Therefore, why not develop a simple index weighing the cost per ton of steel and the cost of labor . . . and apply this index to the original cost of property in question to upgrade or downgrade the cost as the case may be, to convert original cost to current cost" [as a rate base for pipe line companies]. R. H. Hargrove, vice president and general manager, United Gas Pipeline Co., appearing before the Federal Power Commission.

• The Southern Natural Gas Co., Birmingham, has put into effect rate reductions for interstate sales of natural gas to eight utilities and four municipalities in Alabama, Georgia, and Mississippi. The biggest customer to be affected is the Atlanta Gas Light Co., with an estimated annual reduction of over $700,000.

• On the grounds that conditions imposed may be inconsistent with the public interest, FPC has suspended Cities Service Gas Co.'s new rate schedule, which would require the Gas Service Co., Kansas City Gas Co., and the Wyandotte Gas Co., to take their entire gas requirements without exception for 25 years. Cities Service contends that such contractual commitments are necessary to justify the $23 million construction program contemplated for the next four years. A public hearing will be held before a final order is issued.

• Closing the Washington hearings in the FPC Docket G-580 investigation, Presiding Commissioner Nelson Lee Smith said, in part: "Before closing the final hearing in the natural gas investigation, I want to express the commission's appreciation for the fine spirit of cooperation which has been manifest by all those who have participated constructively in this inquiry . . . the broad scope of the inquiry has been amply justified as the only means whereby a comprehensive understanding of the problem as a whole could have been achieved . . . Also it seems not too much to say . . . that this investigation has enabled the industry itself, as well as the commission, to gain a better insight into the problems relating to the natural gas industry and its proper regulation in the public interest."

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NATURAL GAS RESERVES

Discovery of New Reserves and Development of New Means of Reducing Waste Assure Adequate Supply to Satisfy Market for Many Years

By DR. E. DeGOLYER,
DeGolyer and MacNaughton,
Dallas, Texas

THIS PAPER, presented at the Washington Hearing of the Federal Power Commission's Docket G-580 Natural Gas Investigation, was DR. DeGOLYER'S reply to those who contended that end-use regulation of gas was necessary to prevent the supply from being depleted in the foreseeable future. It supplements Dr. DeGolyer's 1945 paper on the same subject (GAS, July, 1945, pp. 19-20). As a collateral study of the nation's fuel reserves, GAS will present next month an interesting discussion of sources of fuel gas from coal, available if and when natural gas should become scarce: "The Nation's Reserve of Solid Fuels And Its Relationship to The Future Supply of Gaseous and Liquid Fuels," by ARNO FIELDNER, chief, Fuels and Explosives branch Bureau of Mines, a paper also presented at the Washington hearing.

MY firm, DeGolyer and MacNaughton, has had in hand for the past two years a detailed study of the nation's natural gas resources and I present our opinion of the recoverable natural gas reserves of the United States at the request of E. Holley Poe and Associates, for whom the survey was made.

It is our opinion that as of January 1, 1946, the United States had a proved recoverable gas reserve in excess of 144 trillion cu. ft. This estimate, except for the Appalachian area and the states of Illinois, Indiana, and Michigan, includes only those fields which have reserves of 20 billion cu. ft. or more. Reserves have been calculated on a pressure base of 16.4 psi and at 60° F. temperature.

Some months ago at the Federal Power Commission hearing at Kansas City, I stated, with certain reservations, that we were justified in considering the gas reserves as of January 1, 1945, to be of the order of magnitude of 200 trillion cubic feet. In light of developments during 1945 and so far to date in 1946, a part-time war period in which steel was not readily available to the industry, it is my opinion that this statement was not exaggerated. Even under adverse operating conditions, estimated reserves as of January 1, 1946, are greater by approximately 4 trillion cubic feet than on January 1, 1945. Gas reserves have continued to increase even though some 4 to 5 trillion cubic feet have been produced in the interim.

Our estimate of gas reserves of the United States is predicated upon our judgment of the fundamental engineering and geological data available. The reserves for the Appalachian area, Indiana, and Illinois, which are comparatively unimportant volume-wise, were based on analyses of composite production decline curves and pressure data.

The gas reserves of the fields in the other states were appraised horizon by horizon and field by field. Reserves wherever possible were estimated by the pressure-production decline method. The reserves of the Panhandle, Hugoton, Monroe, Cayuga, Long Lake, Opelika, Chickasha, Joaquin, Magnolia, Atlanta, West Tuleta, and the Michigan fields, were estimated by this method. In many fields, because of short production history, the reserves were estimated by the volumetric method. In preparing our estimates, all the detailed data available were used, including well logs, formation analyses, structure and isopachous maps, and reservoir performance data. In regard to the basic data, it is our opinion that the information was adequate and substantiates our estimate that the gas reserves of the United States are in excess of 144 trillion cu. ft. My personal opinion is that the estimate is conservative, as are all estimates which must be proved by the information available. We are still of the opinion stated before, that for broad considerations of national planning, we would be well advised to consider our gas reserves to be of the order of magnitude of 200 trillion cu. ft.

A breakdown of the estimated proved recoverable gas reserve by Petroleum Administration for War administrative districts, with a partial breakdown by states, is shown in *Table 1.*

All gas figures are in millions of cubic feet of gas at a pressure of 16.4 psi and a temperature of 60° F.

A more detailed breakdown of the estimated reserves, expressed both in millions of cubic feet and percentages of United States reserves, together with a segregation of the estimated gas reserves in place to gas non-associated with oil, gas associated with oil, estimated recoverable solution gas, estimated recoverable free gas, and total recoverable solution and free gas are detailed by P.A.W. administrative districts and certain states in *Table 3* tabulation.

Estimated 1945 Production

Also shown on this tabulation is the estimated 1945 gross production for the various states. These production statistics should not be used as a yardstick to calculate the future life of the gas reserves because (1) they include gas produced from all fields and not just the 486 fields or areas which have been considered in this study, and (2) the production shown is for the most part estimated gross production and does not take into consideration the great quantities of gas returned to some reservoirs in cycling and repressuring operations.

On the accompanying map are shown the approximate locations of many of the larger gas fields and the major gas producing areas. It is readily apparent upon inspection of this map that the greater portions of the gas reserves are contained in comparatively few areas. This is further illustrated in the accompanying chart from which it will be noted that as of January 1, 1946, 5 fields or areas are estimated to contain approximately

NATURAL GAS RESERVES

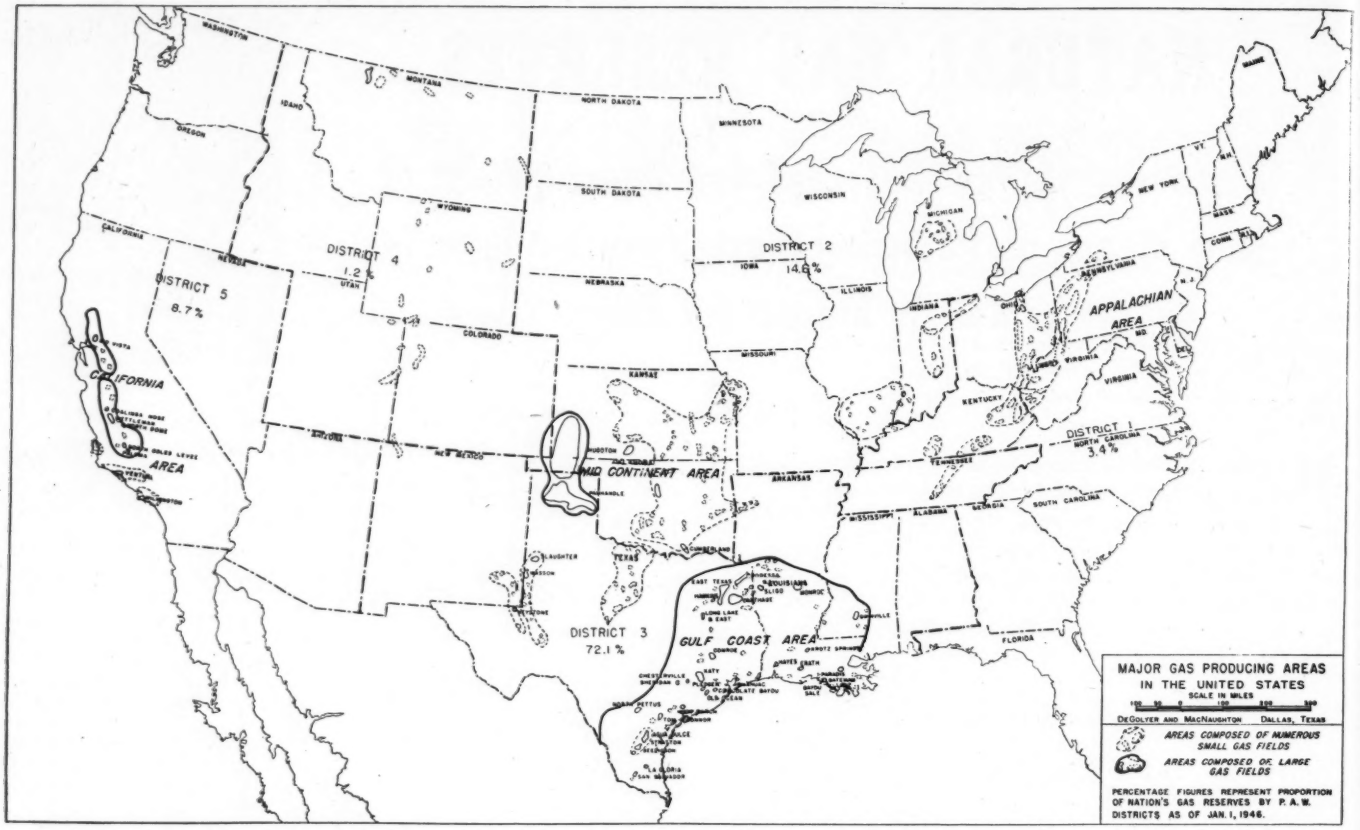


TABLE 1. PROVED RECOVERABLE GAS RESERVES

As of January 1, 1946

District		*Proved Reserves*
District No. 1 (Appalachian Area)		4,930,000
District No. 2		
Illinois	237,500	
Indiana	13,800	
Kansas	13,955,339	
Michigan	132,976	
Oklahoma	6,771,172	
Total District No. 2		21,110,787
District No. 3		
Arkansas	968,416	
Louisiana	13,964,303	
Mississippi	1,358,404	
New Mexico	1,965,250	
Texas	85,773,478	
Total District No. 3		104,029,851
District No. 4		
Colorado	333,600	
Montana	590,800	
Utah	74,679	
Wyoming	664,400	
Total District No. 4		1,663,479
District No. 5		
California	12,555,435	
Total District No. 5		12,555,435
GRAND TOTAL—UNITED STATES		144,289,552

43% of the reserves; 10 fields, 53.1%; 20 fields, 61.6%; and 100 fields, 81.6%. Summing up, it can be said that over 80% of the gas reserves of the nation are located in something less than 2% of the producing fields.

Discovered by Accident

This healthy condition of natural gas reserves has been brought about by accident. Gas has been found as a by-product of the intense search for oil. Almost no effort to prospect for natural gas has been made except in California, in the Appalachian area, and in a few northern states. Solely on this basis, one might assume that future oil prospecting will result in the discovery of gas reserves in approximately the same ratio to the discovery of oil reserves as has been true in the past. We do not think that this will be the case. Until quite recently, the oil industry was little concerned with gas. In the past, many gas shows were plugged and abandoned or neglected because of inaccessibility to market or the prevailing low prices paid for gas. This practice is not likely to continue in the future. If gas is encountered, it will be exploited because additional markets and uses for gas have been and will continue to be developed. If there is a steadily increasing market demand for gas, underground reserves will acquire values which they have not previously had, and exploration for gas itself will be carried on in favorable areas instead of in a few localities where additional supplies of gas are required.

One of the most important sources for the finding of additional oil and gas is deeper drilling, both in known oil fields and in areas which have already been prospected to some degree. Within the last decade, drilling to greater depths has resulted in the discovery of an increasingly greater proportion of mineral hydrocarbons in the gaseous phase to those in the liquid phase than was found in pros-

TABLE 2. ESTIMATES OF RESERVES

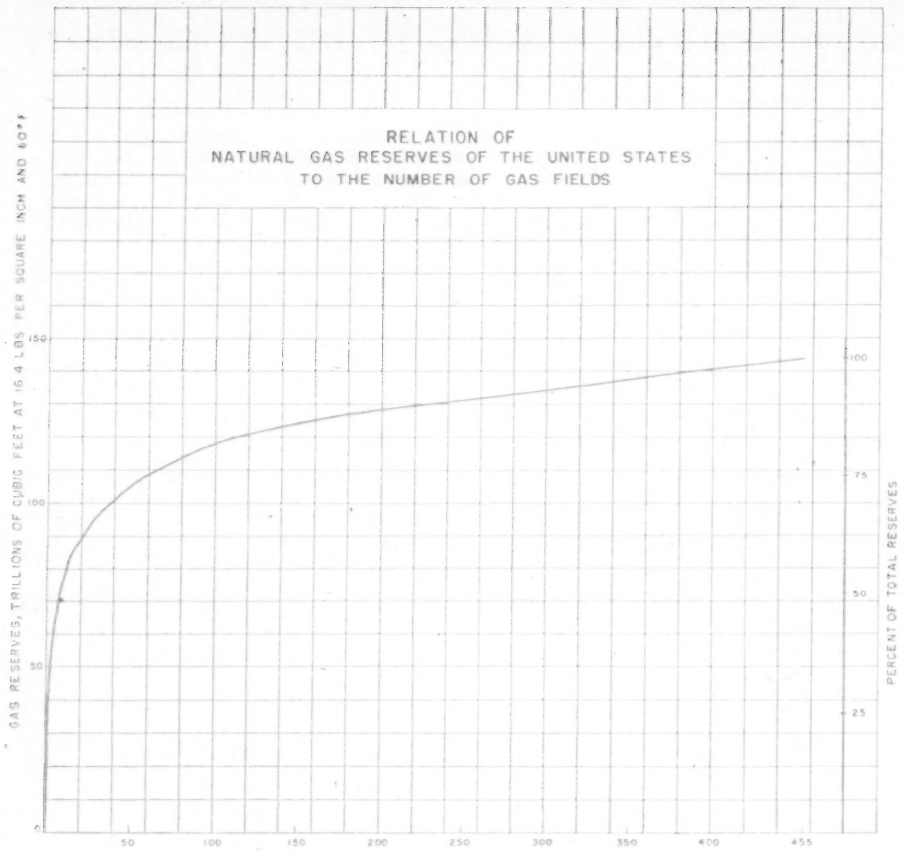
Year	*Trillion cu. ft.*	*Estimate by*
1919	15.0	Shaw
1926	23.0	Source unknown
1931	46.0	Earle P. Hindes
1935	62.0	Ralph E. Davis
1938	66.0	Ralph E. Davis
1939	70.0	Lyon F. Terry
1941	85.0	Ralph E. Davis
1942 (10/1/42)	85.0	Ralph E. Davis
1942	113.8	P. A. W.
1943	110.0	P. A. W.
1944	90.0	Ralph E. Davis
1944	100.0 to 300.0	Lyon F. Terry
1944	110.0	P. A. W.
1944	130.0	Alec M. Crowell
1945	133.5	P.A.W.
1945	135.0	Alec M. Crowell
1945	140.85	DeGolyer and
1946	144.29	MacNaughton

TABLE 3. DATA ON PROVED RECOVERABLE GAS RESERVES OF THE UNITED STATES

As Of January 1, 1946

DISTRICTS	Estimated Free Gas Reserve in Place: *Non-Associated with Oil*	*Associated with Oil*	*Total Free Gas*	Estimated Recoverable Solution Gas Reserve	Total Free and Solution Gas Reserve	Estimated Recoverable Free Gas Reserve	Total Recoverable Solution and Free Gas Reserve	Per Cent of United States Reserves	Estimated Gross Gas Production During 1945
PAW DISTRICT No. 1									
Kentucky									90,000
New York									9,097
Ohio									61,500
Pennsylvania									95,361
West Virginia									200,000
Totals District No. 1	4,930,000	.....	4,930,000	.....	4,930,000	4,930,000	4,930,000	3.42	455,958
PAW DISTRICT No. 2									
Illnois	2,500	60,000	62,500	187,500	250,000	50,000	237,500	0.17	49,000
Indiana	3,150	8,150	11,300	4,200	15,500	9,600	13,800	0.01	1,500
Kansas	15,872,763	.....	15,872,763	.....	15,872,763	13,955,339	13,955,339	9.67	171,000
Michigan	121,600	19,620	141,220	20,000	161,220	112,976	132,976	0.09	19,700
Oklahoma	6,149,071	247,476	6,396,547	1,287,119	7,683,666	5,484,053	6,771,172	4.69	370,000
Totals District No. 2	22,149,084	335,246	22,484,330	1,498,819	23,983,149	19,611,968	21,110,787	14.64	611,200
PAW DISTRICT No. 3									
Arkansas									
North	23,515	.....	23,515	.....	23,515	18,812	18,812	.....	5,000
South	665,391	134,925	800,316	309,351	1,109,667	640,253	949,604	.....	43,000
Totals Arkansas	688,906	134,925	823,831	309,351	1,133,182	659,065	968,416	0.67	48,000
Louisiana									
North	4,277,307	286,246	4,563,553	235,620	4,799,173	3,687,843	3,923,463	.....	.....
South	8,524,830	2,818,462	11,343,292	966,207	12,309,499	9,074,633	10,040,840	.....	.....
Totals Louisiana	12,802,138	3,104,708	15,906,845	1,201,827	17,108,672	12,762,476	13,964,303	9.68	730,000
Mississippi	1,238,490	365,519	1,604,009	75,197	1,679,206	1,283,207	1,358,404	0.94	7,900
New Mexico									
Northwest	200,000	.....	200,000	.....	200,000	160,000	160,000	.....	.....
Southeast	10,000	1,559,000	1,569,000	550,050	2,119,050	1,255,200	1,805,250	.....	.....
Totals New Mexico	210,000	1,559,000	1,769,000	550,050	2,319,050	1,415,200	1,965,250	1.36	135,400
Texas									
District No. 1	40,800	33,000	73,800	1,945	75,745	59,040	60,985	.....	.....
District No. 2	3,782,439	1,972,670	5,755,109	374,061	6,129,170	4,604,087	4,978,148	.....	.....
District No. 3	11,405,114	11,808,784	23,213,898	1,525,902	24,739,800	18,571,118	20,097,020	.....	.....
District No. 4	12,539,092	9,419,363	21,958,455	1,086,776	23,045,231	17,566,765	18,653,541	.....	.....
District No. 5	641,845	.....	641,845	94,900	736,745	513,476	608,376	.....	.....
District No. 6	8,108,653	1,635,950	9,744,603	1,236,276	10,980,879	7,795,682	9,031,958	.....	.....
District No. 7-B	105,000	.....	105,000	.....	105,000	84,000	84,000	.....	.....
District No. 7-C	35,000	28,000	63,000	73,697	136,697	50,400	124,097	.....	.....
District No. 8	32,500	2,384,200	2,416,700	4,205,400	6,622,100	1,933,360	6,138,760	.....	.....
District No. 9	.....	190,000	190,000	128,976	318,976	152,000	280,976	.....	.....
District No. 10	30,143,017	.....	30,143,017	878,000	31,021,017	24,837,617	25,715,617	.....	.....
Totals Texas	66,833,460	27,471,967	94,305,427	9,605,933	103,911,360	76,167,545	85,773,478	59.44	2,636,908
Totals District No. 3	81,772,993	32,636,119	114,409,112	11,742,358	126,151,470	92,287,493	104,029,851	72.09	3 558,208
PAW DISTRICT No. 4									
Colorado	92,000	.....	92,000	260,000	352,000	73,600	333,600	0.23	4,206
Montana	404,000	317,000	721,000	14,000	735,000	576,800	590,800	0.41	32,492
Utah	93,349	.....	93,349	.....	93,349	74,679	74,679	0.05	6,651
Wyoming	299.000	289,000	588,000	194,000	782,000	470,400	664,400	0.46	46,384
Totals District No. 4	888,349	606,000	1,494,349	468,000	1,962,349	1,195,479	1,663,479	1.15	89,733
PAW DISTRICT No. 5									
California									
District No. 1	.....	47,034	47,034	1,313,575	1,360,609	37,620	1,351,195	.....	.....
District No. 2	.....	.....	.....	772,680	772,680	.....	772,680	.....	.....
District No. 3	.....	.....	.....	53,530	53,530	.....	53,530	.....	.....
District No. 4	368,028	1,490,378	1,858,406	1,592,360	3,450,766	1,486,685	3,079,045	.....	.....
District No. 5	5,347,085	1,923,088	7,270,173	1,482,800	8,752,973	5,816,185	7,298,985	.....	.....
Totals District No. 5	5,715,113	3,460,500	9,175,613	5,214,945	14,390,558	7,340,490	12,555,435	8.70	560,820
Grand Totals—United States	115,455,539	37,037,865	152,493,404	18,924,122	171,417,526	125,365,430	144,289,552	100.00	5,275,919

NATURAL GAS RESERVES



pecting to shallower depths in preceding periods. In other words, the deeper prospecting of the past ten years has resulted in the discovery of a greater proportion of gas to oil than previously. It appears likely that this proportion will continue to increase with continued drilling to greater depths.

Estimates of natural gas reserves made since 1919 indicate a steadily increasing trend of discovery. The estimates shown in *Table 2*, unless otherwise noted, are as of the first of the given year.

Developments during 1945 serve to support the opinion expressed at Kansas City that natural gas reserves will continue to increase for a considerable time in the future. The reserves of three large fields in South Texas — Agua Dulce, Stratton, and Seeligson — were included in our 1945 estimate at approximately 4½ trillion cubic feet. Current developments indicate that the area between these fields will be productive of gas and oil and, instead of three fields, it is likely to be a continuous productive area approximately 45 miles long and 3 to 7 miles wide.

Similarly, the productive limits of the Carthage field have been extended and subsurface information indicates this field may be extended farther to the northeast, east, and southeast. Also, the productive limits of the Hugoton field, the largest gas field in area known today, have continued to be extended. In addition to the enumerated fields, developments during 1945 have extended the limits of many other gas fields, and many new field discoveries were made. The full extent of many of these new fields is unknown but because of continuing development in 1946 we believe that some of them will be of major importance and will add substantially to the proved gas reserves of the nation.

Prospects of Expansion

The large-scale natural gas industry is a comparative newcomer to the business world and its possibilities of expansion in domestic, industrial, and chemical fields are great. Increasing amounts of gas are being transported annually from the producing fields to the consumers. Because of the rapid growth in the pipe line take and in the number of gas pipe lines, we continually hear that if the use of natural gas is not restricted, the increasingly greater annual consumption will soon exhaust the gas resources of our nation. On this point, it should be noted that the ratio of annual take to proved resources is twice as good as the similar ratio is for the oil industry.

Consider the Panhandle field, which is the largest single gas reserve known to the world today. During 1934, pipe lines took approximately 165 billion cu. ft. of gas from this field. In 1944, the pipe line take was slightly more than 364 billion cu. ft., which is an increase over the ten-year period of about 120%. However, while the pipe line take from the field was steadily increased, casinghead gasoline plants have reduced their take from approximately 632 billion cu. ft. during 1934 to 365 billion cu. ft. during 1944, a reduction of 267 billion cu. ft. Other gas blown to the air and wasted was reduced from 38 billion cu. ft. to about one billion cu. ft., and gas used in the field was reduced from 24 to 16 billion cu. ft. Thus overall, the field in 1934 produced 859 billion cu. ft. and only 745 billion cu. ft. in 1944. In other words, the Panhandle field actually produced 114 billion cu. ft. of gas during 1944 less than it produced during 1934.

If this were only an isolated case of waste prevention, there the subject would end. But this is one of many fields in which gas waste has been curtailed. A few of the others, and we could name many, are Old Ocean, Agua Dulce, and Chapel Hill, in Texas; Erath and Monroe in Louisiana, and not the least is the work accomplished in South Arkansas by direct cooperation between the producer and the state regulatory body. Here large quantities of the sourest of solution gas, as well as sour free gas, are now sweetened and marketed. The producer, royalty owner, and state are all receiving revenue from what was once a wasted natural resource.

State regulatory bodies and the petroleum industry are actively cooperating to reduce waste to a minimum. The petroleum industry is conscious of the waste that still exists even more than its critics and anxious that all avoidable waste should be eliminated. It has taken steps in that direction and is continuing to make progress. However, all fields are not subject to the same treatment. Conservation of our petroleum resources requires exacting field studies to determine the proper engineering procedures. We know of many of these surveys that have been made and are being made and have seen the results of some of their applications to field practice. We know that petroleum waste has been reduced and that it is continuing to be reduced.

Therefore, with waste of gas being diminished each year, and with the material increase in number and volume of natural gas discoveries, there should be no apprehension as to the ability of the industry to meet market demands in the foreseeable future.

TESTING LARGE-CAPACITY GAS METERS

A Method That May Be Used in The Field

By HOWARD S. BEAN, M. E. BENESH, FRANK C. WITTING

THE DIFFICULTIES of testing large capacity gas meters are familiar to all gas meter men. In the case of some of the large or even medium sized meters of the lobed impeller type not the least of these difficulties is that of moving the meter. And, even if the meter is moved there remains the difficulty of finding equipment of the conventional gasometer type with which to test the meter anywhere near its rated capacity or even its average operating rate. Hence, the following method of testing these meters in place should be of considerable interest to the fuel gas industry.

The field testing method here described was developed in the research department of the Peoples Gas Light and Coke Co. of Chicago with the cooperation of the National Bureau of Standards. The equipment and facilities usesd in developing the method were evolved by one of the authors (Benesh), who made the necessary arrangements for its development. The preparation and assembling of the equipment was supervised by another author (Witting), who also directed the initial tests of meters made with the method. The third author (Bean) assisted in some of the tests and in the preparation and presentation of the results.

This paper on the field method has been abridged from a more complete account of large-capacity gas meter testing appearing in the September issue of the National Bureau of Standards "Journal of Research." In addition, the paper in the "Journal" contains a description of another method of testing these large-capacity gas meters in which the meter is actually operated up to or above its full rated capacity.

Mr. Bean is chief of the gas measuring instruments section, National Bureau of Standards. Mr. Benesh and Mr. Witting are both with the Peoples Gas Light and Coke Co., the former being chief research engineer, the latter a research engineer.

Part 1. Description of Equipment

THIS method of testing rotary gas meters is made up of three separate tests, namely: (1) determination of the meter's displacement, usually referred to as the displacement test; (2) determination of the rate of flow through the meter clearances corresponding to different pressure drops across the meter, referred to as the clearance test; and (3) the observation of the pressure drop across the meter when it is operating at different rates is referred to as the rate test. When the second or clearance test is made with air, an additional test is needed by which the clearance flow with gas can be calculated from the rate obtained with air, and this test is referred to as the auxiliary clearance test.

The principal items of equipment used to make these several tests, shown diagramatically in Figs. 1, 2, and 3, include a small reference meter with a driving motor and gearing, a second motor and gear system for driving the industrial meter, mechanically operated breather, rubber bag differential pressure indicator, small suction type air blower, diaphragm type gas meter, brake, and such additional items as thermometers, manometers, and stop watch. A better understanding of the testing procedure will be gained if some of these items are described in some detail.

Reference Meter

This reference meter was obtained by the addition of various special parts to a standard 2½ x 3 in. rotary blower provided with special inlet and outlet flanges.[1]

The conversion of a small rotary blower into a very accurate displacement meter is accomplished by providing the exact amount of external power necessary at all times to permit the blower to operate without any flow through its impeller clearances. The external power is supplied by a 1/20-hp. induction motor through a six-step variable speed reducer and chain driving system. These six speeds permit the meter speed to be varied from 96 to 1475 rpm in steps of equal geometric progression. Since the operation of this type of meter tends to produce pulsations, particularly in the inlet chamber, which may affect the accuracy of the meter's indications, large chambers are attached to the inlet and outlet openings of this meter to dampen these pulsations, and as a further aid, the inlet chamber, which is the larger, is filled with wire cloth.

These dampening chambers are suitable for the dampening of all the higher frequency pulsations but their capacity is insufficient for the low frequency pulsations occurring during the operation of the meter at the two lowest meter speeds. As the suppression of low frequency pulsations is difficult unless chambers of very large size are used, these pulsations are eliminated at their source by the use of a compensating piston and cylinder breather. The cylinder of this breather is connected to the meter inlet while the piston is operated by the driving system of this meter at such a rate that it travels through four complete cycles for each revolution of the meter. A steady flow of air into the meter is obtained by synchronizing the motion of this piston with the positions of the meter impellers.

Regulation of the rate of flow of air or gas through the reference meter, and therefore through the service meter under test also, is by means of the parallel connection of a 2-in. and a ⅜-in. plug cock attached to the reference meter outlet. The condition of zero pressure drop through the reference meter is indicated by a gauge consisting of an oil bead about 1½-in. long in a slightly bowed glass tube, with self draining enlargements at each end. The number of revolutions made by the reference meter during the interval of a test is obtained from a revolution counter, driven from one impeller shaft through a clutch, which can be engaged or disengaged without loss of motion, slippage or over-run.

The reference meter, its stilling chambers, breather, gear box, and revolution counter are assembled in a common wooden case, as this not only aids in temperature control but also provides protection and greater con-

1 It is not essential that this meter be of the rotary type. Flow meters could be used but the calculation of the results with them would be much more tedious. Other types of displacement meters could be used, providing they are sufficiently accurate and retain their calibration within less than 0.1% for a reasonable period of time.

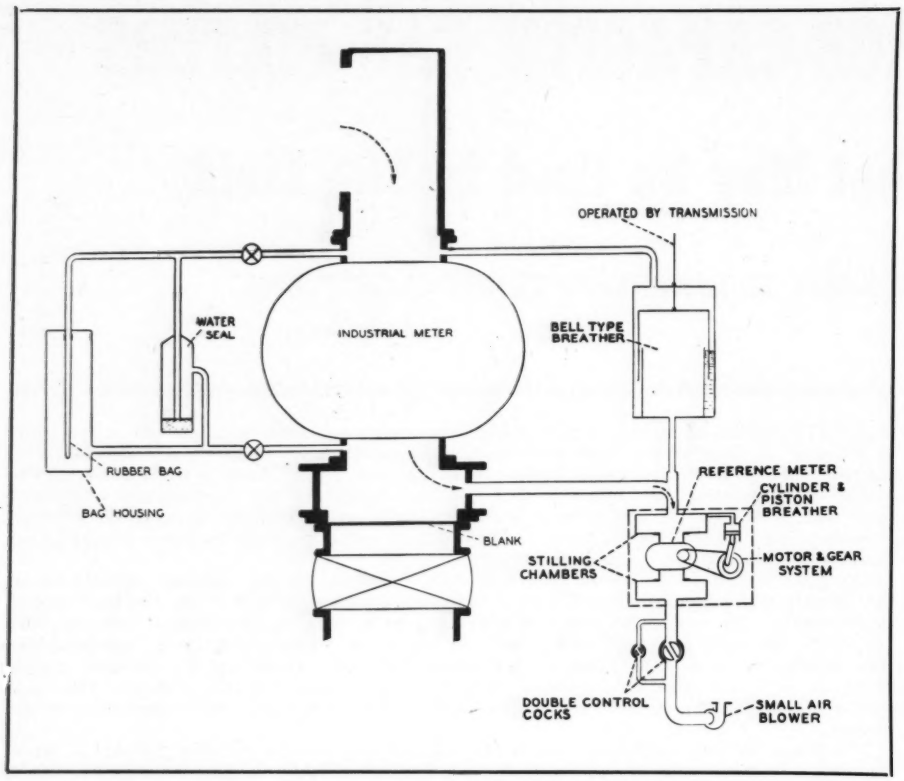


Fig. 1. Diagram of equipment and connections for the displacement test of a rotary gas meter.

venience in moving. The control cocks and differential pressure gauge are of course on the outside of the case. The driving motor is mounted on the top of the case so that heat from it will not affect the meter.

This meter was calibrated by direct comparison with a piston meter[2], which was used as a primary standard. The influence of pressure pulsations on the accuracy of the reference meter was checked by interposing various sized chambers between the two meters. These chambers were introduced to simulate the outlet connection volumes of various sizes of industrial meters, and it was found that the calibration of the reference meter was unaffected by the size of these chambers when the meter was operated at the four highest of the six possible meter speeds, or when the piston breather was used with the lower speeds. In the subsequent use of the assembled reference meter unit, the piston breather was used whenever the meter was operated at any of the three lower meter speeds.

The results of calibrating the reference meter are shown in *Fig. 4.* The upper curve gives the meter displacement per revolution without the piston breather, while the lower curve gives the displacement at the three lower rates when the piston breather is used.

[2] See R. P. 908. "Journal Of Research," N.B.S., Vol. 17, Aug., 1936, p. 218.

Motor and Transmission System for Driving Industrial Meter

The power for driving the industrial meter under test is obtained from a 1/15-hp., 110-volt Universal motor, provided with an extremely sensitive governor by means of which the motor speed can be held within very close limits at any desired value between 3000 and 7000 rpm. The transmission system contains a series of spur gears which reduce the high motor speed to the low meter speed, and the gearing is so arranged that any one of six different gear ratios may be used which double or halve the adjacent speeds. These gears are completely enclosed in a metal housing with provision for continuous lubrication. The motor is mounted on the outside of this housing so that the two form a single piece of apparatus.

The output from this unit is suitable for driving all sizes of meters up to and including the 12 x 36-in. size. For driving the larger sizes of meters both lower speeds and greater torque are required, and these are obtained by the addition of a second gear box. The combinations of gear ratios that can be obtained in conjunction with the variations in motor speed makes it possible to drive meters at speeds of less than 1/15 to over 15 rpm. When in use, the output shaft is aligned with and coupled to the meter hand wheel. The weight of the unit as well as the reaction to driving the meter are carried by an adjustable support bolted to the transmission housing.

The displacement test of the industrial meter is based on the requirement that there be no appreciable

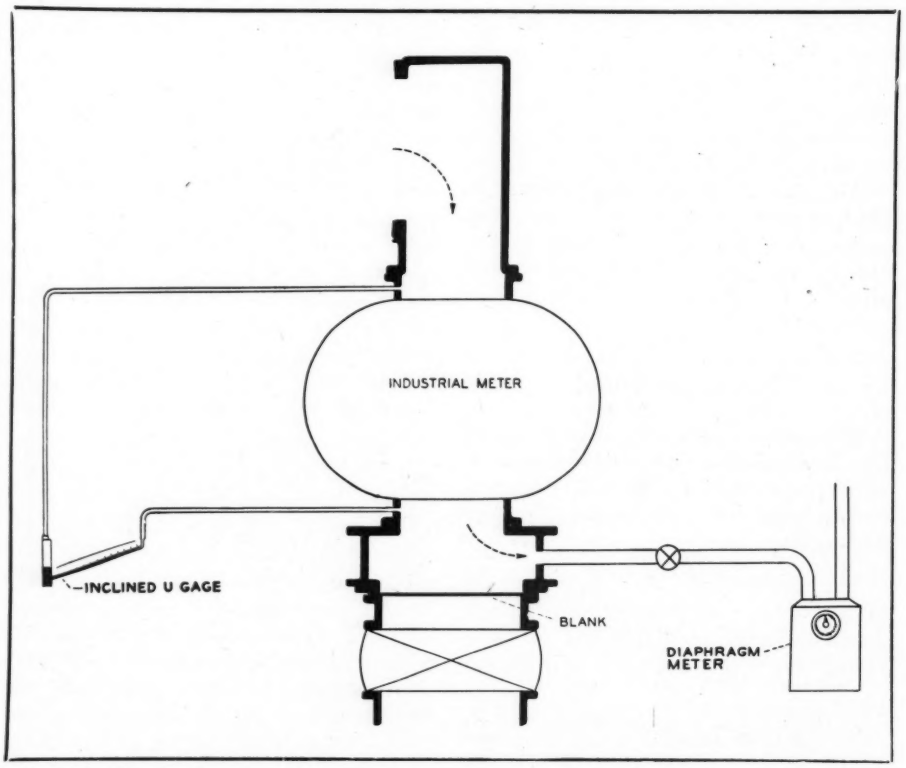


Fig. 2 Diagram of equipment and connection for clearance test of rotary gas meter.

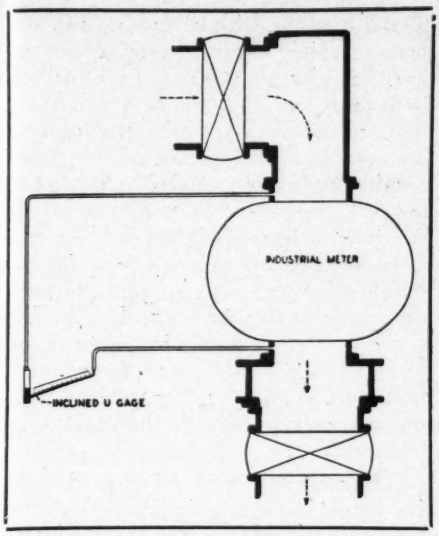


Fig. 3. Equipment and connections for the rate test of a rotary gas meter.

pressure difference between its inlet and outlet. Also, the use of another rotary meter, operated at constant speed as the reference meter for this test, imposes the additional requirement that the flow reaching the reference meter shall be steady and non-pulsating. As the discharge from a rotary meter pulsates with a frequency of four times the meter speed, it is necessary to apply some means of neutralizing the pulsations. This is accomplished by the combined actions of a properly synchronized mechanical breather, for neutralizing the larger flow irregularities, and a very lightweight breathing diaphragm (the differential pressure indicator), for removing the small remaining irregularities.

Two sizes of mechanical breathers are used in this work to cover the full range of sizes of rotary displacement meters. The smaller of these breathers used in the testing of all meters up to and including the 12-in. and 36-in. size is an accordion type bellows mounted within a pressure vessel. One face of the bellows is fastened to the inside face of the pressure vessel. The other face is movable with its actuating rod passing through a packing gland. The bellows are operated from a cam which is a part of the mechanical drive and transmission system, and the amplitude of the bellows movement is regulated by an adjustable linkage system between the cam and bellows. The cam rotates at four times the speed of the industrial meter, and is synchronized with the meter impellers at the time of attaching the driving unit to the meter. The space within the bellows is connected to the meter inlet, and that between the bellows and pressure vessel is connected to the meter outlet.

A simple prover bell suspended by a wire and enclosed within a pressure vessel serves as the large breather. A larger size cam and linkage system is used with this breather, but otherwise the method of its connection and operation is the same as with the smaller. This breather is diagramatically illustrated in *Fig. 1.*

Differential Pressure Indicator

This piece of apparatus is formed by a long, wide and narrow bag of very thin rubber suspended within a pressure chamber. The narrower sides of this chamber contain glass windows and the bag is suspended so that, when hanging freely, the narrow edges of the bag are visible through the windows. The inside of the bag is connected to the inlet side of the meter under test, and the space between the bag and the pressure chamber is connected to the meter outlet. Thus any difference between the inlet and outlet pressures will cause the bag to swell or flatten. Since the force opposing any difference between inlet and outlet pressures is due to the small horizontal component of the weight of the bag it follows that extremely small differences of pressure will distort the bag. A continuous distortion of the bag in one direction does not mean that the pressure difference is increasing so much as it means that the direction of the difference remains unchanged. As will be mentioned later, the method of keeping the bag in its neutral or zero position is by regulation of the speed of the motor used to drive the industrial meter. The relatively large capacity of the chambers of this differential pressure indicator make it possible to reduce the number of speed adjustments necessary to maintain zero pressure difference. Furthermore, this large capacity assists in smoothing out any small fluctuations

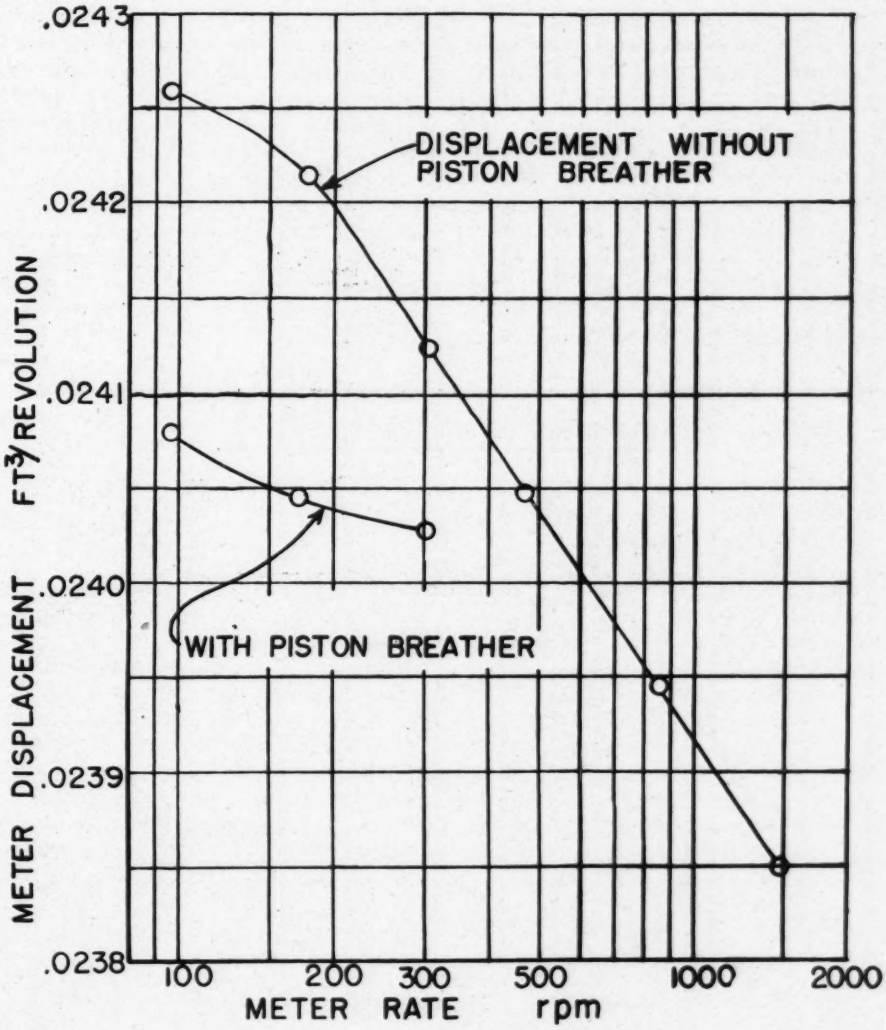


Fig. 4. Calibration curves of the 2½-in x 3-in. rotary reference meter. Addition of breather changes capacity of the clearance volume of the system, and by making flow through meter steadier, decreases flow through clearances. Hence, the difference in calibration curves for the two conditions.

in the rates of flow through the industrial meter and small reference meter.

The extended range in size of the rotary meters make it necessary to provide two sizes of breather differential pressure indicators, one having ten times the volume of the other. To protect these indicators against injury from excessive pressure differences, they are provided with shallow water seals which are part of their cases.

Small Air Blower, Diaphragm Meter and Brake

The small air blower is a direct-connected, electrically driven blower capable of withdrawing 2000 ft.[3] of air per hour at a negative pressure of about two inches of water and discharging it into the atmosphere. This blower is used to draw air (or gas) through the industrial and reference meters during the displacement test.

As explained later in the description of the clearance test, a diaghragm meter is used to measure a small flow of air or gas vented from the outlet side of the industrial meter. Two sizes of ordinary diaphragm meters of commercial design and accuracy are used to cover the large range in sizes of the rotary meters. The smaller of these two meters has a capacity of 150 cu. ft. per hour and is used in the testing of 10-in. x 30-in., and smaller, rotary meters. The larger diaphragm meter has a capacity of 1 Mcf per hour and is used in the testing of the larger rotary meters. It is desirable that these meters should be equipped with observation indexes.

The brake is a simple wooden clamp that fits over an enlargement of the shaft extension of the impeller which is not directly driven by the motor and transmission system. The purpose of this brake is to supply sufficient braking force to take up all the back lash in both the meter gears and the gears in the driving system.

The remaining equipment required for the field method includes a stop watch, four thermometers, one vertical water manometer, one inclined water manometer, a revolution counter and all necessary tools, pipe fittings and rubber hose required to connect the various units to the industrial meter.

Part 2. Methods of Conducting the Tests

Displacement Test

As this test is usually made with air[3] the first step is to close the inlet and outlet valves, to seal the outlet line with a blank plate,[4] and to remove a short section of the inlet piping, or to otherwise open the meter inlet to the air. The testing equipment is then connected as shown in *Fig. 1*, with the small air blower connected to the outlet to draw air through the system. The meter is purged of the gas, first by manual rotation of the impellers and then by the small air blower to remove any gas remaining in the system. The location of the meter hand wheel is checked to see that it engages the proper impeller shaft so the driving system will rotate the meter in its normal operating direction. The driving system is coupled to and aligned with the hand wheel. The cam for operating the breather is loosened and rotated until its position bears the correct phase relationship to the meter impellers, and is then locked in position.

[3] This test is not influenced by the gas composition. The line gas can be used where there is no difficulty in its disposal; however, the number of installations of this type are few.

[4] If a blank plate cannot be installed in the outlet line, the line between the meter and outlet valve should be sealed with water.

The reference meter is set so as to be in a level position and its zero differential pressure gauge is adjusted so that the oil bead is centered in the bowed tube. A water manometer is connected to measure the static pressure in this meter. The gears of the meter's driving system are set to operate the meter at a displacement rate equal to one per cent or less of the rated capacity of the industrial meter to be tested. To bring the system into final adjustment for a test the cocks in the lines to the zero differential indicators of both the industrial and and reference meters are closed, and the motors driving the industrial meter, the reference meter, and the blower, are started simultaneously. The flow of air through the reference meter is adjusted by placing the 3/8-in. cock in about mid-open position and adjusting the 2-in. cock until upon cracking the zero differential indicator cocks the oil bead remains near the mid position. The indicator cocks are then fully opened and zero differential pressure is maintained by constant manual adjustment of the 3/8-in. valve.

Next, the rate of rotation of the industrial meter is adjusted to correspond with the rate of flow through the reference meter. To do this, the cocks to this meter's differential indicator are cracked and by regulation of the speed of the driving motor the meter speed is adjusted until the rubber bag remains in a neutral position. The indicator cocks are then opened wide and the meter speed is further adjusted until the bag shows no definite tendency to swell or flatten. However, the bag will usually show an oscillating motion, which can be reduced to a minimum by adjusting the amplitude of the mechanically operated breather.

While these adjustments are being made, as well as throughout the test, the brake installed on the industrial meter is set to maintain just enough braking force to eliminate all back lash between the meter gears, and to

TABLE I. METER DISPLACEMENT TEST

Meter No. 11246 — Meter Size 10" x 30"
Location—Southport and Courtland — Date—Nov. 20, 1940

		Industrial Meter				*Reference Meter*			
Time Interval		Index Reading	Static Pres.	Temperatures		Index Reading	Static Pres.	Temperatures	
				Inlet	Outlet			Inlet	Outlet
1		2	3	4	5	6	7	8	9
Min.	*Sec.*	*Rev. × 4*	*In. H_2O*	*°F*	*°F*	*Rev. × v*	*In. H_2O*	*°F*	*°F*
0	0	28265	0.0			53226.45	0.0		
1	0			51.9	50.7			53.7	54.5
3	0			51.9	50.8			53.5	54.5
5	0			52.0	50.8			53.3	54.5
7	0			52.0	50.8			53.1	54.3
9	0			51.9	50.8			53.0	54.2
11	0			51.9	50.9			52.9	54.1
13	0	28387		51.9	50.9			52.7	54.0
15	28		0.0			58415.81	0.0		
Revolutions		30.5				5186.36			
Averages			0.0	51.97	50.81		0.0	53.17	54.30
				51.39				53.74	
Absolute			29.59	509.39			29.59	511.74	

Reference Meter Displacement from Fig. 4 for 335 rpm, dr, 0.024108 ft³

Industrial Meter Displacement, $di = \frac{0.24108 \times 5186.36 \times 29.59 \times 509.39}{30.5 \quad 29.59 \quad 511.74} = 4.0806$ ft³

maintain a slight load on the driving motor.

Thermometers are placed in the inlet and outlet connections of the two meters, and the equipment is ready for test as soon as the inlet and outlet temperatures of each meter agree within $\pm 1.5°$ F. The rest positions of the two zero differential pressure indicators are checked and a record of the reading of the reference meter counter is made just before a test is started. The start of a test occurs as a mark on the industrial meter hand wheel passes some reference point; the reference meter counter is started at the same instant by the engagement of its clutch. While the test is in progress one operator regulates the speed of the industrial meter and another regulates the $\frac{3}{8}$-in. cock so that zero differential pressure is maintained across each meter. A third observer reads the meter thermometers and inlet pressures every two minutes throughout the test, and keeps a record of the number of revolutions made by the industrial meter, either by direct count or by observation of the meter counter readings at the start and finish of a test, and measures the duration of a test with a stop watch.

The usual duration of a displacement test is from 15 to 20 minutes. The test is concluded by disengaging the reference meter index as the mark on the industrial meter hand wheel again passes the reference point. The reference meter index reading is recorded, each observer is shifted to perform different duties, and a second test is made as soon as all conditions have been verified.

Upon completion of the second test, the rest positions of the two zero differential pressure indicators are checked to be sure there has been no shift, and the results from the two tests are computed. These results by different observers should agree within (0.15%) and are computed by the equation:

$$di = \frac{dr}{Ni} \times \frac{Nr}{} \times \frac{pr}{pi} \times \frac{Ti}{Tr} \qquad (1)$$

in which

d (ft^3) = displacement per revolution,

N = number of revolutions,

p (in. Hg) = absolute pressure at meter inlet,

T (in. F. deg.) = mean of the average inlet and outlet absolute temperatures, i.e., observed temperatures, +458

Where

subscript i = industrial meter under test

subscript r = reference meter.

Table I shows the observed data and computed result from the displacement test of a 10-in. x 30-in. meter.

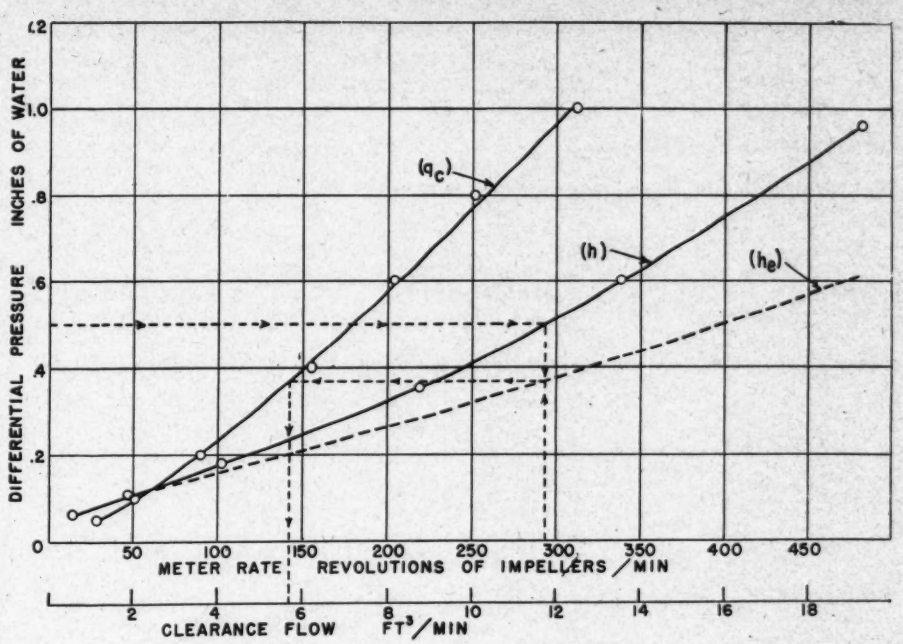


Fig. 5. Curves for the relationship between meter speed, clearance flow, actual pressure drop, and effective pressure drop of rotary gas meter.
qc (ft^3/min.) = rate of flow through clearances
h (in. H_2O) = actual pressure drop through the meter
he (in. H_2O) = pressure drop, which is effective in producing the flow through the clearances

Clearance Test

The purpose of this test is to determine the relation between the pressure drop across a meter and the rate of flow through the clearance spaces of the meter. This is done by developing a pressure difference across the impellers by mechanically driving the meter with the outlet closed. The gas that is thereby pumped into the closed outlet chamber by the rotation of the impellers returns to the inlet chamber through the clearance spaces.

Since the inner surface of a meter case is slightly uneven, the width of the clearances between the impellers and case will vary for different angular positions of the impellers. Hence in trying to maintain a constant pressure difference across the impellers, it would be necessary to vary the rate of rotation throughout each revolution, going faster as the impellers pass a wide clearance space and slower as they pass the narrower spaces. This, however, would not give a true leakage-time relation because the time interval taken to pass a given arc of narrow clearance will be longer than that taken to pass an equal arc of wide clearance. To overcome this disadvantage, the meter is driven at a constant rate of rotation by the driving system used with the displacement test, and the pressure difference is maintained constant by venting a small variable flow of air or gas from the discharge chamber of the meter. This vented gas or air is metered with the diaphragm meter, and its volume reduced to the conditions (i. e., temperature and pressure) that exist within the rotary meter. The simple subtraction of this metered volume from that calculated by multiplying the meter displacement by the number of revolutions gives the clearance flow during the test period.

Since the rate of flow through the clearance spaces will vary with the specific gravity (i. e., density), and viscosity of the gas, it is desirable from this standpoint to make this test with the same kind of gas that the meter is to measure. To do this, the removed section of the inlet pipe is replaced, the inlet valve opened, the meter completely purged of air, and the testing equipment used with the displacement test replaced with that shown schematically in *Fig. 2.* It is noted that both the breather and differential pressure indicator are removed and replaced by the inclined draft gauge, and the small rotary reference meter is replaced by the diaphragm meter. During a test the observed quantities are: draft gauge reading, number of meter revolutions, time interval, and volume of gas vented through the diaphragm meter. Determinations of the volume of clearance flow are made at a number of different pressures covering the operating range of the meter and the result from each is expressed in terms of cubic feet

TABLE 2. CLEARANCE TEST

Meter No. 11246 — Date—11-22-40
Meter size—10" x 30" — Location—Southport and Courtland
Rated hourly capacity—110,000 ft//hr.
Meter displacement Listed by Manufacturer—4.115 ft^3

Differential Pressure	Time Interval	Volume Displaced by Rotation of Meter	Volume through Diaphragm meter	Volume through clearances Col. 3—Col. 4	Rate of flow through clearances 60 x Col. 5 x Col. 2 / 60 x Col 5+Col. 2
1	2	3	4	5	6
in. H_2O	*sec*	*$ft.^3$*	*$ft.^3$*	*$ft.^3$*	*$ft.^3/min.$*
0.05	92.2	4.115	2.35	1.765	1.15
.10	63.4	4.115	2.14	1.975	1.87
.10	64.0	4.115	1.93	2.185	2.05
.10	64.0	4.115	1.95	2.165	2.03
.20	54.1	4.115	0.87	3.245	3.60
.40	55.2	8.230	2.73	5.48	5.96
.40	54.9	8.230	2.57	5.66	6.19
.40	54.9	8.230	2.54	5.69	6.22
.60	53.4	12.345	5.07	7.28	8.18
.60	53.4	12.345	5.05	7.28	8.18
.80	53.4	12.345	3.44	8.90	10.00
.80	53.2	12.345	3.39	8.96	10.11
1.00	61.4	16.46	3.73	12.73	12.44
1.00	61.1	16.46	3.73	12.73	12.50

per minute by using the following equation:

$$qc = \frac{(Nd\text{-}V_1)\ 60}{t} \qquad (2)$$

in which

qc (ft^3) = clearance flow per minute
N = number of revolutions
d (ft^3) = displacement per revolution
V_1 (ft^3) = volume of vented gas (difference of diaphragm readings).
t (sec) = test period

Table 2 shows the observed data and computed results from the clearance-pressure drop test of the 10-in. x 30-in. meter.

Auxiliary Clearance Test

In most installations the industrial meter is in a location where small amounts of gas discharged through the diaphragm meter cannot be vented conveniently, so the clearance test is made with air. In this case the test is performed in the manner just described; the only difference is that in setting up the equipment the inlet section of pipe is not replaced and the small blower is connected to draw air through the diaphragm meter. Afterwards an auxiliary test is made to obtain factors for computing the rates at which gas would flow through the clearances. To do this all flow through the diaphragm meter is stopped and the differential pressure across the impellers is held constant by varying the speed of the industrial meter. This speed variation as well as the driving force necessary to operate the meter is obtained by the manual operation of the hand wheel and the only test equipment required is a draft gauge and a stop watch. One series of tests is made with air in the meter, and another series of tests is made after the meter has been reconnected and purged with gas, just previous to the removal of the blank in the meter outlet for its return to service. The tests in this series are made at the same differential pressures as were recorded during the regular clearance test with air, so individual conversion factors are thus obtained for each originally-recorded differential pressure.

While this procedure may not be quite so accurate as that of making the clearance test with gas, no significant differences have been noticed. On the other hand, it has the advantage that it furnishes clearance data on meters which are independent of the gas being metered at the time, and thus facilitates the comparison of meter tests, and provides a basis for a simple method of checking the condition of the meter in the future.

Rate Test

This test consists of observing the differential pressure across the meter impellers corresponding to various operating rates of the meter. The differential pressure is read from the draft gauge, while the rate of operation of the meter may be determined with a stop watch and the direct observation of a revolution counter or tachometer.

As this test is affected by the gas composition it is always performed in the field under normal operating conditions. To place the meter under these conditions, the hand wheel is disengaged, the inlet section of pipe replaced (if it was not replaced earlier), the blank or water seal in the meter outlet is removed and all the special test equipment except the draft gauge is removed. *Fig. 3* shows the meter connections for this operation and cols. 1 and 2 of *Table 3* show the observed data taken during the test on the 10-in. x 30-in. meter.

It should be noted from *Fig. 3* that the meter is connected in the line so all the gas passed through the meter goes to the user whose consumption the meter has been installed to measure. As it is desirable to vary the meter speed to cover an extended operating range, it will be necessary either to have a bypass around the meter or to arrange with the user to vary the rate of consumption to suit the various rates desired in the test. In some cases the total consumption of the user may be considerably below the rated capacity of the meter, but this is not objectionable so long as the actual operating range is covered during the test.

Part 3. Computation of The Meter Proof

THE proof of a rotary industrial meter is obtained from the results of the tests described above by a combination of graphical and mathematical steps. The first step is to plot the results of clearance test and the rate test on a common mat, as illustrated by lines (h) and (qc) of *Fig. 5.* The next step is to compute and plot the values of the effective pressure drop (he) across the clearance channels for the determination of the net clearance flow. The reason for this step and a fuller explanation of it are briefly as follows:

When the impellers of a rotary meter are in motion, a velocity pressure is produced just ahead of each impeller tip where it is closest to the meter case. Also, a negative velocity is produced immediately behind each tip. Each of these pressures is equivalent to the velocity pressure corresponding to the tip speed of the impellers. The combined effect of these two velocity pressures tends to produce

TABLE 3. RATE TEST AND METER PROOF

Meter No. 11246 — Meter speed at rated capacity 445.5 rpm — Date 3-24-39

Meter Size—10" x 30" — Location—3921 S. Wabash Ave.

Meter Speed	Observed Differential pres. h	Adjustment for tip velocity 4/3 hc	Effective Differential pres. he	Gas Flow Through Clearance Channels		Meter Displacement		Listed by Mfg'r	Meter Proof	Meter Speed % rated capacity
				qc	qc	at zero pressure difference	at obs'd pressure difference			
1	2	3	4			7	8	9	10	11
rpm	*in. H_2O*	*in. H_2O*	*in. H_2O*	*ft.³/min.*	*ft.³/rev.*	*ft.³/rev.*	*ft.³/rev.*	*ft.³/rev.*	%	%
14.41	.061	.000	.061	1.4	.0972	4.0806	4.1778	4.1150	98.50	3.23
48.16	.102	.003	.099	2.0	.0415	4.0806	4.1221	4.1150	99.83	10.81
102.31	.177	.016	.161	3.1	.0300	4.0806	4.1106	4.1150	100.11	22.96
219.11	.356	.072	.284	4.7	.0214	4.0806	4.1020	4.1150	100.32	49.18
333.94	.603	.168	.435	6.6	.0197	4.0806	4.1003	4.1150	100.36	74.95
481.87	.963	.349	.614	8.3	.0172	4.0806	4.0978	4.1150	100.43	108.16

a flow of gas or air through the clearance space in a direction counter to the flow produced by the normal differential pressure across the meter. Similar velocity pressures, acting to produce more flow in the same direction as the main gas flow through the meter, are produced at the so-called contact line between the two impellers. However, the differences between the velocities of the impeller surfaces at this line is lower than that between the impeller tips and case. Similar velocity pressures are produced between the ends of the impellers and meter case but again the average velocity difference between the two surfaces is less and in addition the length of these clearance channels is much greater.

An analysis of the probable effects of these velocity pressures together with studies of the results of numerous meter tests indicated that their combined effects are very nearly equal to four-thirds the velocity of the impeller tips. The effective pressure drop (he) is evaluated by the empirical equation:

$$he\ (in.\ H_2O) = h - 4/3\ hc \qquad (3)$$

in which

h (in. H_2O) = total observed pressure drop across meter corresponding to any particular meter speed.

hc (in. H_2O) = velocity pressure corresponding to the tangentical velocity of impeller tips.

The value of hc is computed as follows:

Let

D (in.) = maximum diameter of the meter impellers

N (rpm) = meter speed

g (ft/sec/sec) = acceleration due to gravity

G (ratio) = specific gravity of the gas, air = 1

v (ft/sec) = velocity

and using

0.075 (lb/ft³) = average density of air at meter

62.34 (lb/ft³) = average density of water in manometer

32.17 (ft/sec³) = acceleration of gravity

then

$$hc = \frac{v^2}{2g} = \frac{N\pi D}{12x60}^2 \frac{0.075x12xG}{2x32.17x62.34} \qquad (4)$$

$$= 4.27\ G\ (ND)^2 \times 10^{-9}$$

Cols. 3 and 4 of Table 3 show values of 4/3 (hc) and (he) computed for the 10-in. x 30-in. meter, and the values of (hc) plotted against rpm are shown by the dotted line in *Fig. 5.*

The third step in the computations is to obtain values of the net clearance flow by means of the three curves of *Fig. 5*, corresponding to each observed value of the pressure drop (h), *Col. 2 of Table 3.* This is done by starting on line (h) with one of the values from Col. 2, moving vertically down to the line (he), then horizontally to the left to the intersection with the line (qc) and vertically down to the clearance flow scale to read the net value of (qc). This is recorded in *Col. 5 of Table 3.*

The fourth step is to divide the values of (qc) in *Col. 5* by the corresponding values of N, *Col. 1*, thus giving values of the clearance flow per revolution. These values are then added to the static meter displacement obtained from the displacement test, thus giving the dynamic displacement per revolution *Col. 8.*

The results of gas meter tests are commonly reported by what is known as the meter's proof. It is the factor, expressed as a per cent, by which the indications of a meter must be divided in order to obtain the true volume of gas metered. Hence, the fifth step is to compute the values of the meter proof by dividing 100 times the listed meter displacement, as given by the manufacturer, by the several values in *Col. 8* and listing the results in *Col. 10.*

These computations are all that are needed as far as any individual meter is concerned. However, in order to be able to compare the proof curves of meters of different design and size, it is desirable to refer them to a common basis. Such a basis is obtained by expressing the meter speed as a per cent of the meter speed at rated capacity. The speed at rated capacity is obtained by dividing the rated capacity of the meter, as given by the manufacturer (usually given in ft3/hr), by 60 times the listed displacement. Hence, the sixth and last step in the computation is to divide 100 times the meter speeds of *Col. 1* by the rated capacity speed and listing the results in *Col. 11.* The result of plotting the values in *Col. 10* against those of *Col. 11* is shown by the curve of *Fig. 6.*

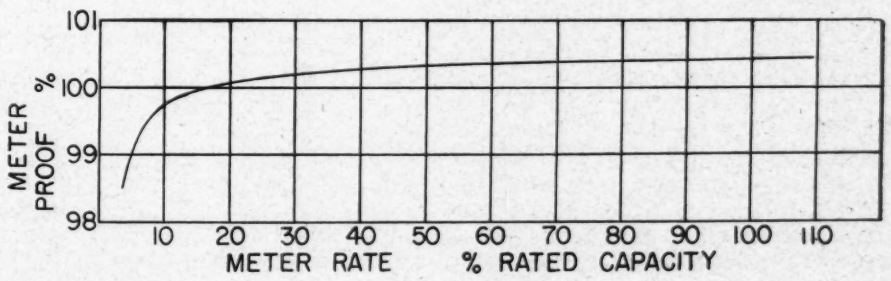


Fig. 6. Proof curve of 10-in. x 30-in. rotary meter derived by field test method.

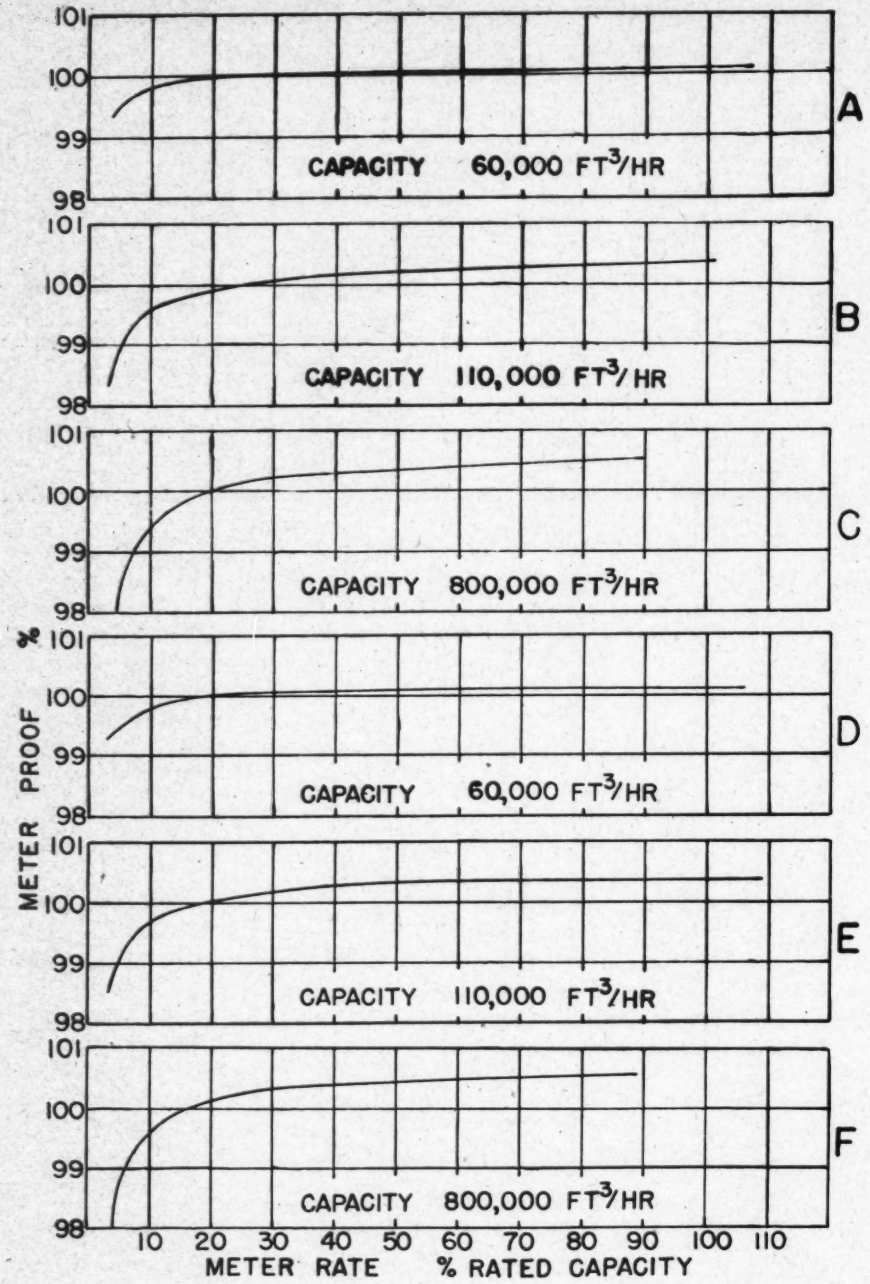


Fig. 7. Results of testing three sizes by the field method. Graphs A, B, C show condition of meters as found at time of test. D, E, F show condition after cleaning and oiling impellers.

Part 4. Some Results from Tests of Rotary Gas Meters

FIG. 7 shows the results of testing three different sizes of rotary gas meters by the field method. The top three graphs are the results of tests made immediately after the meters were disconnected from service. The bottom three graphs are the results after the impellers had been cleaned and oiled. By comparing the first with the fourth, and so on, it appears that the cleaning and oiling had almost no effect on the values of the meter proofs.

Fig. 8 shows the proof curve for a new meter of the same size as that of *Graphs B and E of Fig. 7*, which had been in service over five years. This illustrates the very small difference which was found between the calibration curves of new and used meters of the same size. As there were a number of other cases similar to this, it appears probable that the effect of age upon the proof curve of these meters is almost negligible, at least within the age limit (about 20 years) of the meters tested up to the time of making this study.

The following is a summary of the results from testing more than 17 rotary gas meters, ranging in capacities from 12,000 to 800,000 ft³ per hour.

1. The average proof of the meters, in good mechanical condition, over the range of 5% to 150% of rated capacity, is between 98% and 101%.

2. The proof curve of any individual meter is within ±0.25% of the group average over the range of 20% to 150% of rated capacity, and is within ±0.5% of the group average over the range of 10% to 20% of rated capacity.

3. The size of a meter has very little influence on its proof curve when the meter speed is expressed as a per cent of the meter speed at the manufacturer's rated capacity or speed for the meter.

4. The static displacement of a rotary gas meter appears to be almost unaffected by corrosion or deposits, even those resulting from unpurified gas. Hence, having been once determined, it will seldom have to be redetermined.

5. After a rotary meter has been tested once by the field method including a hand operated clearance test for reference, its condition at any subsequent time may be ascertained by making a simple hand operated clearance test. If the result of this test does not differ by more than 50% from the original, the percentage change can be applied directly to the clearance curve and a new calibration curve developed.

6. The internal surfaces of a rotary meter can be cleaned satisfactorily, with a minimum interruption to the customer's service by several flushings of the meter with a non-corrosive solvent.

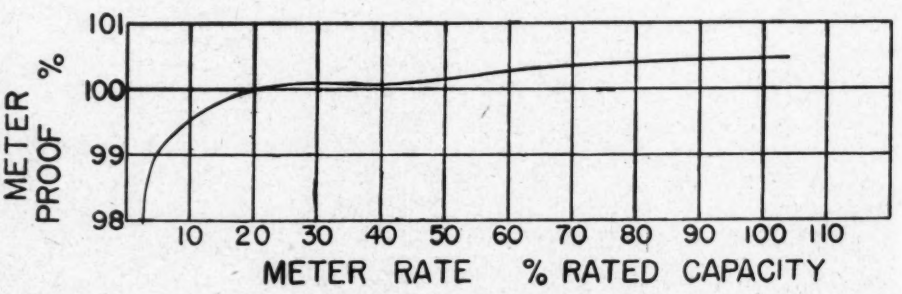


Fig. 8. Proof curve of new 110,000 chf meter.

California's great natural gas field is one of the largest in the nation. This article is the third in a series, which to date has dealt with the Hugoton and Panhandle fields, and is prepared by Mr. Dahlgren as a study of the nation's major sources of gas.

THE cities of San Francisco, Oakland, Sacramento, and Stockton in California are extremely fortunate in having the largest natural gas field in the state so accessible to their fuel needs.

The Rio Vista field has the greatest gas reserve of any oil or gas field in the state and is also one of the outstanding fields in the nation. Its present estimated productive acreage of about 24,259 acres is the largest of any California gas field. In size it is exceeded in the state only by the Midway - Sunset oil field in the San Joaquin Valley. The caloric value of its gas is the highest of any California-produced natural dry gas. It also has the greatest number of producing horizons of any gas field there.

The field is located partly on the mainlands and partly on the islands of the Sacramento river delta. The field encircles the town of Rio Vista, which is 30 miles southwest of Sacramento, 27 miles northwest of Stockton, and 40 and 45 miles northeast of the cities of Oakland and San Francisco, respectively. It is the primary source of fuel gas for northern and central California and supplies about 80% of the fuel requirements.

On July 1, 1946, a total of 126 producing gas wells had been completed in the field. As of January 1, 1946, the field had produced 558,154,929,000 cu. ft. of gas. Special Study No. S-525, June 1, 1946, "Estimate of the Natural Gas Reserves of the State of California," prepared by the California Railroad Commission and the California Department of Natural Resources, estimates as of July 1, 1945, a gas reserve of 3,617,855,941,000 cu. ft. A later report shows a reserve of 3,543,540,437,000 cu. ft. as of January 1, 1946.

The Rio Vista field was the third northern or central California gas field to be developed. Its discovery followed that of McDonald Island field by less than a month and also followed, by less than a year, the discovery of the Tracy gas field, the first commercial gas field developed in central or northern California.

The discovery well, the Amerada Petroleum Corp's. Emigh No. 1, was completed June 19, 1936, at a depth of 4485 ft. with an initial daily production rate of 8750 Mcf of gas through a one-half tubing bean from the bottom 207 feet of formation. The casing pressure was 1700 pounds and the tubing pressure 1375 pounds. The shut-in pressure was 1720 pounds. Tests made by a formation tester be-

Geologic Age	*Formation*	*Thicknesss*	*Description*
Recent to possibly Upper Miocene	No names given. Correlations uncertain (Includes San Pablo). Unconformity	1900′-2900′	Surface alluvium, peat and gravel, and non-marine non-fossiliferous mostly gray to brown clay, and dark gray to black ill-sorted medium to coarse sand, gravel beds, considerable sandy green shale in lower portion, and pale green tuffaceous claystone.
Eocene	Markley (Kreyenhagen)	690′-2200′	Marine—mostly carbonaceous brown shale interbedded with fine to medium grained glauconitic silty sand with abundant white mica flakes, forams, occasional sandstone shells and small amount of blue carbonaceous silty shale.
	Nortonville (Emigh Shale)	270′- 500′	Marine—dark brown brittle platy shale containing fish scales, forams, diatoms and radiolaria, locally pyritized, streaks of fine to medium glauconitic sand at base, occasional shell fragments.
	Unconformity	70′- 150′	Marine—mostly fine silty greenish-gray glauconitic sand, numerous shell fragments and calcareous sandstone shells, some beds brownish gray shale and greenish gray siltstone, foram and plant remains.
	Domengine Unconformity		
	Capay (Ione)	200′- 315′	Fresh water to brackish—most light gray to white, loose to friable, medium to coarse clean well-sorted quartzose sand interbedded with bluish-gray massive claystone containing small pyrite particles and quartz grains.
	Capay Shale Unconformity	325′-1075′	Marine—mostly compact brittle fractured carbonaceous foraminiferous grayish-green shale, sometimes silty, with streaks of fine grained micaceous gray quartz sand.
	Meganos Uniformity (?)	1520′ of formation has been penetrated below the Capay shale.	Marine—sand and shale—friable, fine to medium, micaceous carbonaceous gray sand; fine to coarse well-sorted carbonaceous light gray to white quartz sand sometimes containing red, green and black colored minerals; fine to medium, greenish-gray glouconitic sand; hard, mostly light to dark brown micaceous carbonaceous shale, sometimes pyritized, streaks of lignite common.
Paleocene	Martinez		
Cretaceous (?)			

Table 1. Formations Represented in Rio Vista Field (from "Summary of Operations, California Oil Fields," 30th annual report).

fore completion had given rates of flow, measured by side static flow method, as high as 24,000 Mcf per day. The total depth was 4485 feet and 11¾-in. casing was cemented at 4278 feet with a 6⅝-in. liner landed on bottom. By the end of the year two additional wells were completed and two unsuccessful wells were drilled.

Operations Extended

Development operations during the following years resulted in a steady extension of the productive limits to the east and south. Operations in 1937 resulted in extending the limits as far east as the town of Rio Vista. In 1938 the completion of the Texas Co.'s Midland Fee No. 1 well extended the productive limits of the field east across the Sacramento River for over two miles.

Until recently production was obtained from only the Emigh zone, which has a maximum development of about 400 feet, and is encountered at a depth of about 3800 feet at the apex of the structure. The zone, which has the greatest areal extent of any zone in the field, consists of two sand members, an upper member, the "green" sand, and a larger lower member known as the "white" sand. The "green" sand is also referred to as the Domengine zone *(see Fig. 3.)*

Development operations in the last few years have resulted in the discovery of possibly four more productive gas zones in the field. Developments were hastened by war emergency demands in 1942 and 1943.

The West Hamilton zone, the first of the new zones, was discovered by the Amerada - Mary Hamilton No. 1 well. This well, west of the Midland fault, was drilled into cretaceous sediments to total depth of 6792 feet, had encountered 90 ft. of gas sand from 5510 to 5600 feet. Later testing proved the production of gas at a rate of 4000 Mcf per day. However, the well was not completed in the Hamilton sand but was finally plugged back and completed as a producing well in the Emigh zone.

The Anderson A-6 zone is encountered only in the area west of the Midland fault and is found from 25 to 60 feet below the base of the overlying Hamilton zone. Only two wells have been completed in the Anderson zone, although a number of wells have penetrated the zone and have found it wet. Development thus far indicates that the productive portion of the zone all lies on the western edge of the field within a narrow belt around the two wells.

East Midland

The East Midland zone is found only east of the Midland fault. It is about 650 ft. below the top of the Emigh zone and consists of a gray quartz sand that is similar to the Hamilton sand. The zone has a thickness of about 450 ft. and contains about 90% sand. Water is encountered about 4615 ft. below sea level. About half of the zone is wet because only the upper portion of sand is above the gas-water contact.

The Midland 5 zone consists of light gray quartz sand in an otherwise solid shale body immediately below the Midland zone. It is the third and deepest zone in the area east of the Midland fault. Only one well has been completed in the Midland 5 zone.

East and West Emigh

The Emigh zone has been divided into two areas—East Emigh and West Emigh. As of July 1, 1946, the East Emigh area had 12 wells, while the West Emigh area had 69 wells. The West Hamilton has 29 wells, while the East Midland zone has 13. The Anderson A-6 zone has two wells; the Anderson A-7 zone one. Grand total for the entire field is 126 wells.

It is interesting to note the accumulated production by zones as of January 1, 1946:

Zone	*Production in Mcf.*
East Emigh	57,462,654
West Emigh	464,624,928
West Hamilton	12,080,435
East Midland	22,176,203
Anderson	1,810,709
	558,154,929

The Rio Vista field is an irregularly shaped northwest-southeast trending, elongated dome that possibly has a very complicated fault pattern. The trend of the structure appears to be but slightly inclined from a north-south line and is elongated to the southeast. The location of the field in the river delta area gives no indication of the field's subsurface structure. Structural interpretations which re-

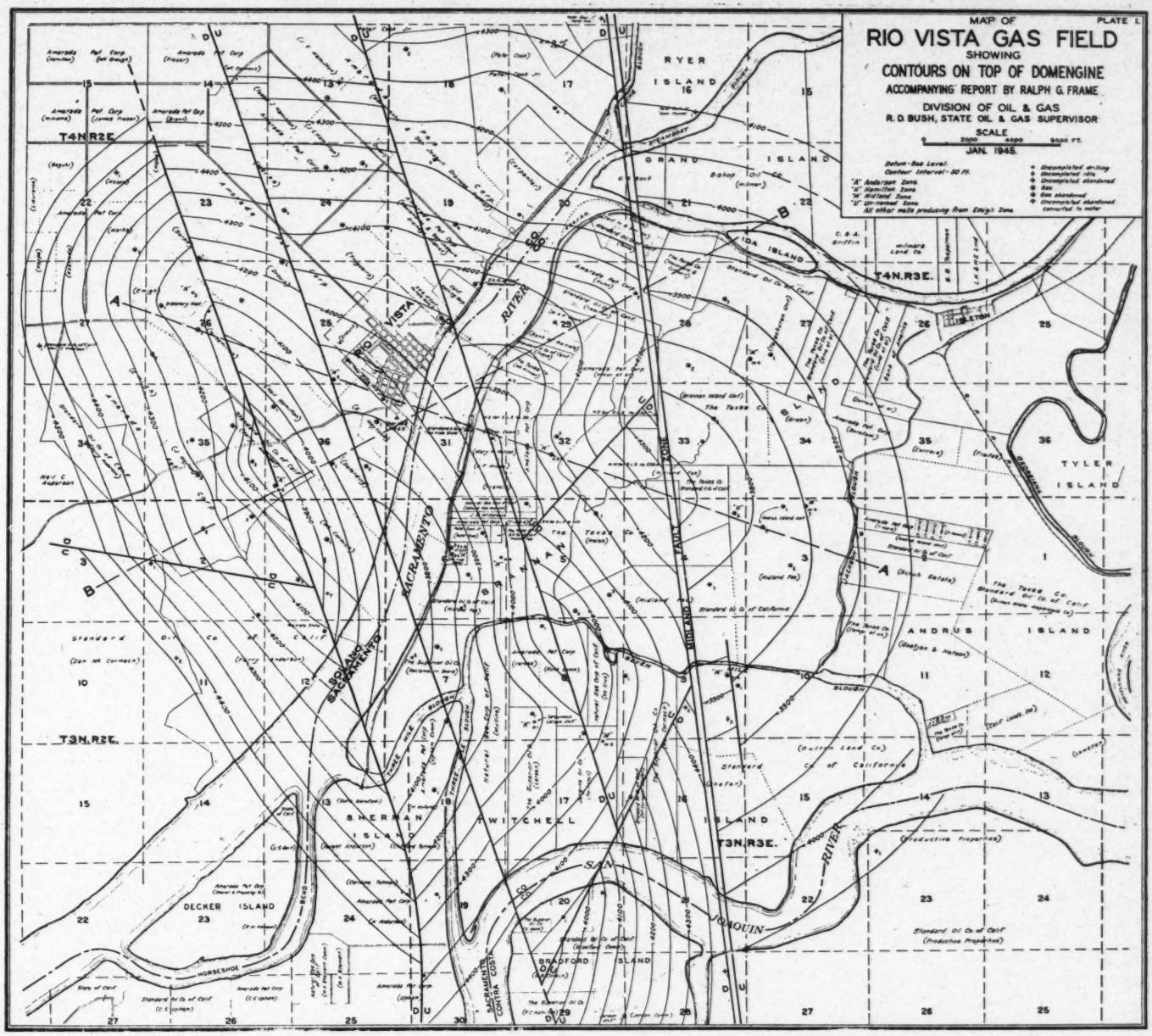


Fig. 1. Contour map (from "Summary of Operations, California Oil Fields.")

sulted in exploratory drilling were based on reflection-seismograph data obtained during a geophysical survey of the area.

A longitudinal or strike fault cuts the flank of the structure. This fault apparently extends along the entire eastern flank of the field but production is obtained from the Emigh zone on both sides of the fault.

The productive Emigh zone is of Eocene age. The upper third of the Emigh zone, which includes the "green" sand, belongs to the Domengine formation (Middle Eocene). The lower two-thirds of the zone contains the "white" sand. Below the Capay sand (Ione) is found 335 feet to 1075 feet of Capay shale which overlies the Hamilton and Midland zones. The Anderson sand is separated from the overlying Hamilton sand by from 25 to 60 feet of shale of Meganos formation.

Drilling Practices

No particular difficulty has been experienced in drilling operations in the Rio Vista field. All wells were drilled with rotary tools. The first wells drilled, when considerable coring and testing were done, required from 35 to 45 days to complete. When sufficient knowledge of the field had been gained, the general practice became merely to drill to a calculated depth and run an electric logging device to determine the top of the gas zone. This procedure enabled the Emigh zone wells to be completed in from 15 to 25 days. Several wells were located along the banks of the Sacramento river and the wells directionally drilled so as to bottom under the river.

The following table shows the production per year since the date of discovery, June 19, 1936:

YEAR	PRODUCTION IN MCF
1936	123,973
1937	1,249,948
1938	3,799,238
1939	6,772,221
1940	8,223,070
1941	15,805,109
1942	76,697,619
1943	129,356,559
1944	156,553,264
1945	159,580,333
TOTAL TO JAN. 1, 1946	558,154,929

The field is operated under a ratable taking plan which recognized the six separate zones. The total field outlet is apportioned to the various zones in

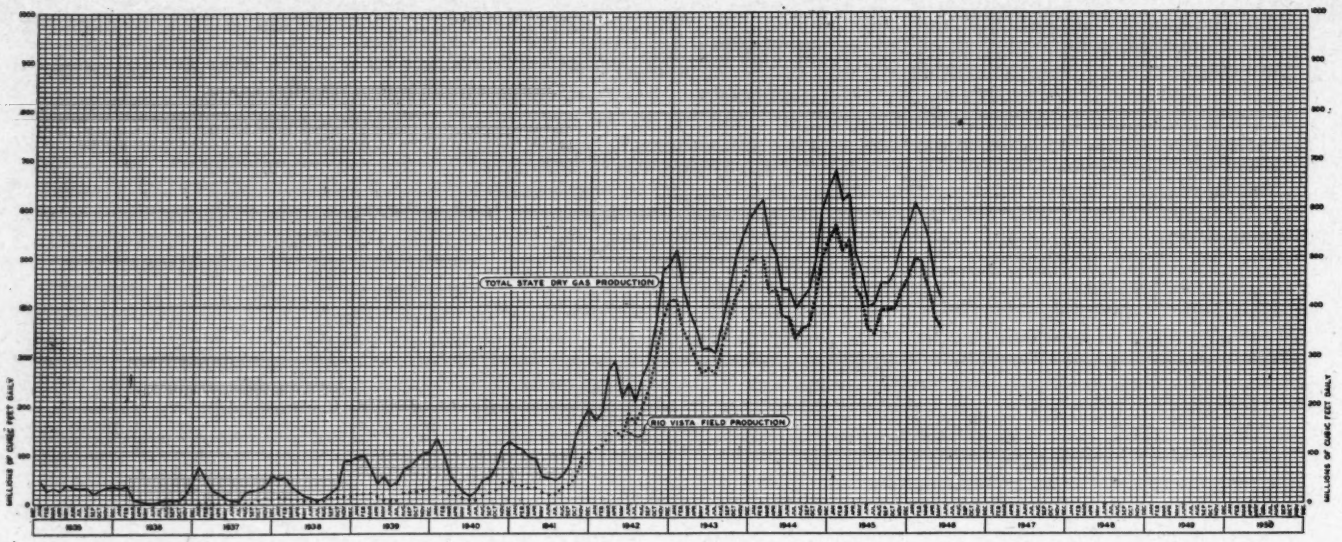


Fig. 2. Chart indicating percentage of total state production contributed by Rio Vista.

relation to the ability of each zone to produce under good operating practices. The production from each zone is, in turn, apportioned ratably to the property producing from such zone on the basis of participating acreage within the productive limits of the zone. The physical operation of the field is carried on by the Amerada Petroleum Corp. with the exception of three wells owned by Peter Cook. Four operators—the Amerada Petroleum Corp., Standard Oil Co., The Texas Co., and Superior Oil Co. control about 94% of the acreage.

Field Operations by Radio

It is interesting to note that Amerada maintains two fixed short wave radio stations and eight mobile units in carrying out the field operations. The majority of the calls are giving instructions to men in the field to make rate changes requested by the Gas Control Dispatchers in San Francisco. As many as 70 well-changes have been required to make the necessary production and allocation schedules in a day. Close supervision and planning is essential to coordinate the well allocations with the gas companies' requirements. The radio equipment was installed in 1944. The main station, at the field headquarters, consists of a 50-watt FM transmitter operating on 31,180 kilocycles. The second fixed station is installed in a farmer's house on Bradford Island to facilitate the operation of the six wells by the farmer. The mobile stations are in company cars and are of 30-watt power.

The gas reserves of the Rio Vista field have steadily increased in importance. For some time Rio Vista has been the source of supply for many cities and towns such as Sausalito, San Rafael, Petaluma, Napa, Vallejo, and other North Bay district communities served by the Pacific Gas & Electric Co. Since the 26-in. gas line from Kettleman Hills to the San Francisco Bay region was converted to an oil line early during the war, the Rio Vista field, instead of being an auxiliary gas source, has become the major supply source for the Bay district and all other heavily populated areas in central California.

The four outlets from the field are:

(1) A 12-in. line of Pacific Gas & Electric Co. from the West side of the field northwesterly to a junction about seven and a half miles northwest of the town of Rio Vista, where it branches into two 10-in. lines, one going northerly to Davis, Woodland, and Sacramento, and one westward to supply the North Bay district.

(2) A 10-, 16-, 22-, and 24-in. series and parallel line system of Pacific Gas & Electric Co. from both east and west sides of the field in a general southwesterly direction by way of Antioch and Livermore to the bay system at and about eight miles north of Milpitas.

(3) A 10-, 12-, and 16-in. series and parallel line system of Stanpac and Pacific Gas & Electric Company from the east side of the field southwesterly to Los Medanos, where connection is made with the northern end of the Old Standpac line from Kettleman Hills, consisting of 22-, 24-, and 26-in. series line, extending westerly to San Pablo.

(4) A 12-in. line of Pacific Gas & Electric Company from the east side of the field to Los Vinas, a point on the 16-in. line about midway between Vernalis and Sacramento.

The maximum daily capacities of the Rio Vista outlets on the basis of uniform peak day operations are approximately as follows: (1) 82 MMcf; (2) 258 MMcf; (3) 163 MMcf; (4) 120 MMcf. It is estimated that the entire capacities of line systems 1, 2, and 3 would be required currently at least part of the day to meet extreme peak day firm demands, while the full capacity of line system 4 would not be required.

The gas has a calorific value of 1040 Btu and consists of about 96% methane, 3% ethane, and 1% mixture of other hydro-carbon fractions and inert gases.

A study of the monthly production data shows that January, 1945, was the largest month with a daily average of 563.7 MMcf. The smallest month in 1945 was July, with a daily average of 344.1 MMcf. During the first 3 months in 1946, January was the highest month with 495.4 MMcf daily average.

Royalties Aid City

It is interesting to note that the city of Rio Vista is a farming community. Gas royalties from lands within the city limits now comprise a major portion of the city's income, which was collected from local taxpayers prior to the discovery of oil and gas. Substantial royalties are also paid to the State of California for gas produced from lands underlying the Sacramento and San Joaquin rivers, which pass through the field.

Rio Vista field is a key factor in supplying the varying needs of the gas utility companies. Prior to the discovery of the field, much of the fluctuation in gas company requirements had to be taken care of by gas production from California oil fields. This involved changing production of oil wells to obtain desired volumes of gas.

The Responsibility of

MANAGEMENT FOR SAFETY

By EDMUND T. PRICE

President, Solar Aircraft Co., San Diego, Calif.

ALL of the safety engineers and other experts in this field will agree at the start that safety *is* management's responsibility and hence there is nothing to talk about. It would perhaps be more stimulating to present a paper on the somewhat more controversial issue that safety is *labor's* responsibility, or at the very least a joint responsibility. There are a few items in our experience which may be new and interesting and which may perhaps allow some of you to return to your respective plants better equipped to do the job of selling safety. First, last, and all the time the job of accident prevention is that of salesmanship.

Reverting for a moment to the responsibility which corporate management has on the subject of safety it is proper to mention first that there are strictly humanitarian issues which cannot be ignored. Within the confines of company-owned property there are thousands of men and women whose health and physical fitness are the responsibility of management not only by law but by moral right.

It is management's privilege to provide these safeguards even if it were not a duty. Enlightened management in modern industry can contemplate with satisfaction the improvement in morale and even in the quality of work which arises and which is produced in a safe and sanitary plant. The humanitarian aspects of safety are an integral part of modern management even though the mere recital of this fact in the abstract tends to open it for attack on sentimental grounds. Even though it may be more difficult to prove, this humanitarian issue can be shown to pay off in dollars and cents sufficient to satisfy the most skeptical of managers who view a safety program on merely a cash basis.

I am told that this was not always so. Many of you are more familiar than I with the history of the safety movement during the 20th century. Previously, life and limb were cheap, with the human carcass discarded when it could no longer contribute to the profits of an inanimate, corporate entity. Today, management can gauge its success by the attitude of the employees and the attitude of the community itself towards those men who are conscious of their accident responsibility. I believe that there are few managers who now can long survive in their positions of authority unless they sympathetically consider the protection of people committed to their care.

And yet, human nature is a queer thing. Most of the difficulties in accident prevention with which management and its safety engineers contend will be in the failure of the employee to protect himself with the precautions and safety aids that are furnished. I shall have more to say on this subject in a few moments, merely remarking at this point that even this human frailty is another one of management's responsibilities.

A new company just forming will find itself insured, willy-nilly, with a responsible carrier under a rating that sometimes fits as closely as a size number nine shoe fits on a small boy. In the effort to comply with all the new rules and regulations the company hires a safety engineer and tells him to go to work, aided by the experts from the insurance company. In many instances management cannot yet afford a safety engineer and management, itself, assumes this responsibility along with the hundreds of other duties and responsibilities which management must undertake in a small and growing company.

This was, therefore, my responsibility in our small company in California during the early thirties. Originally, as an aircraft manufacturing plant, we enjoyed a relatively favorable rate. I think the so-called "manual rate" established by the California rating bureau was slightly over $2 per $100 of payroll.

When we stopped building airplanes and went into the business of manufacturing exhaust manifolds, our manual rate jumped to something over $5 per $100 as the rating bureau classified our company as a sheet

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SAFETY IS NOT, of course, a concern of the gas industry alone; and accordingly, although among different industries the safety problems and factors may differ radically, all industries seek the answer to a common question: How can we make a safety campaign work?

E. T. Price

Although Mr. Price, as president of the Solar Aircraft Co., San Diego, Calif., is in a field removed from the gas industry, his experiences in tackling the problem of accident reduction and prevention are of value to any industry. So impressed by this paper was ALBERT W. TURNER, safety inspector for Southern California Gas Co., when he heard it delivered at a recent management meeting of the Industrial Safety Society, that he had it reprinted and distributed among top executives and supervisors in his company. The editors of GAS, likewise, feel that in presenting methods and results, this article can be of real benefit to its readers.

In putting safety to work in his organization, Mr. Price and his colleagues knew that their first job was to sell safety. He knew that the best way to accomplish this was to get the worker himself to participate, and this he did.

Mr. Price is no sentimentalist. That safety promotion is necessary from a humanitarian standpoint he takes for granted. Of additional interest to management, he feels, is the fact that safety pays off in another way, as well—in dollars and cents. Insurance rates may be materially reduced, as they were in the case of Solar Aircraft; man-hours lost may be cut, and production will show marked gains. He does not merely say these things; he proves them.

Mr. Price has been with Solar Aircraft since 1928, when he was appointed vice-president and manager. Two years later he became president. Graduated from Haverford College, he had business experience in New York for several years before becoming vice president of the W. R. Reynolds Co., Jackson, Mich., in 1927.

He is a director of the California Safety Council, and the San Diego Employers Association, and is a member of the Southwestern Advisory Committee of the National Association of Manufacturers. He also holds membership in numerous other organizations.

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metal shop. Perhaps we were, but we protested and finally compromised with the classification of tube manufacturing, which carried the manual rate of $2.33 per $100 of payroll. This manual rate is to be compared to the schedule rate which is that figure assiged to each plant by the rating bureau after an inspection of the buildings, mechanical safeguards, safety program, safety committees, First Aid facilities, and other similar conditions installed by management. In California this is the yardstick of comparison with established standards. However, actual premiums are paid on the so-called "net rate," which is the schedule rate times the experience percentage. The latter is computed yearly and is the amount of the premiums consumed, based upon the average of the previous three years.

Financial Returns

I find in looking over our records for 1933 that we had a manual rate of $2.33. Apparently the rating bureau didn't think much of our shop because they gave us a schedule rate of $2.51. However, our experience was 93% average for the previous three years, which brought the net rate back to $2.33. Two years later, with the improvement in safety features, our net rate was down to $1.96. Two years later, in 1937, it had dropped to $1.61, with only slight fluctuations in between. By 1940 it had further dropped to $1.43. The next year it was $1.26, and ten years after the start of the safety drive it was $1.06, with an experience ratio of 72%. I might add that at the present time, under self-insurance, we are carrying reserves at the standard premium rate but enjoy an experience ratio between 40% and 45% during the past two years. Going back, however, to 1942, I find that the amount of premiums paid was $70,410.23 at the net rate of $1.08. However, the important point is this—if we had not put on a safety drive over this 10-year period we now would have had to pay an annual charge of $151,903.55 at the $2.33 rate charged in 1933. In other words, the difference or savings effected in 1942 was $81,493.32 as a result of this effort, disregarding the other savings also obtained in the intervening nine years.

The financial effects of this 10-year drive for safety in our plant are proved in dollars and cents. It is safe to say that no other minor investment can bring such outstanding returns. Even if there were no moral responsibility to the employee or to the community, safety, as management's responsibility to the stockholders, is firmly established. Possibly our company has been most fortunate, and in many ways I think it has been, but I can submit some further striking figures which show the effects of a safety drive in one of the more dangerous operations in our company.

Again we will consider that the humanitarian aspects need no further emphasis, and we will undertake to prove the point by the financial gains and the improvement in effective man-hours of the skilled workers.

In our forming department, which stamps many different types and shapes and sizes of stainless steel sheet, we use air or rope-operated drop hammers of various sizes. A male die is bolted to the hammer head and, frequently, the combined weight of the head and its die reaches the weight of one and one-half to two tons, sometimes as high as ten tons. This hammer, with the die, falls on its counterpart by gravity or by air pressure through a drop of three or more feet to form the sheet metal blanks. The space between the dies, when the hammer head is raised and held by the latches, is wide enough for the operator to reach in with his head and shoulders to examine the semi-finished stamping. Frequently, as the metal wrinkles before it assumes the smooth contours of the finished part, it is necessary to reach in and, with a hand hammer, pein the objectionable folds and other critical areas which might spoil the stamping.

When this work has been done by either the operator or the helper, complete understanding must exist between the two men by signals or other means for withdrawal of fingers, hands, arms or head prior to the release of the safety catches and fall of the great weight. Various forms of sliding guards and other protective devices have been tried but the main success was achieved in dealing with the men themselves. This took the form of a special safety drive for the forming department alone. Going back to 1942, there had been 44 accidents in which nine resulted in permanent injuries for the 12 months ended Oct. 31, 1943. There were 19 lost time cases among these accidents, with 23,512 man-hours lost. This may give some indication as to the seriousness of the problem. Fortunately, there were no deaths. However the medical and compensation bill in this department alone in our company for the 12 months under review amounted to $15,631.34. In addition, the cost of permanent disability cases, including artificial limbs, was $14,953.65 or a total of $30,584.99.

Early in November, 1943, a special meeting was held in the office of the senior vice president of the company in San Diego for the purpose of discussing the situation. There were present the senior vice president, the works manager, the industrial relations director, the personnel manager, the insurance administrator, and the safety engineer. A safety program came out of this discussion with the realization that further work and expense in supplying guards and other protective devices would have little effect in improving the record.

"Selling" Safety

It was determined that the largest part of the problem lay in the job of selling safety to the workers themselves. Management's responsibility was not so much in supplying safety devices as it was in teaching the worker. Management must enlist the support of the worker. It must arouse his interest. It must get the worker to think. You don't get this from rules and regulations; you get it from stimulating the worker and acting promptly on his suggestions.

When a safety drive brings these principles into play, the results are astounding. Basically, however, it is a job of salesmanship, and first, last, ad all the time, as I have said, the safety egineer has a selling job to do.

In our case, management agreed that the first step was to close the entire forming department on each of the three shifts for one hour a month for special safety meetings, on company time. Twice a month would have been better. The first meeting was attended by the operators and helpers and also by the shift superintendents, plant manager and the works manager. The losses of the past year which had been suffered by the individuals involved in the accidents were discussed in detail. Principally, the men themselves were encouraged to talk but before the meeting had progressed very far it was apparent there was a certain amount of reluctance on the part of the operators and their helpers to open up the talk freely. In discussing this with management it was decided that the presence of the supervision itself was an impediment and so, except for the foreman and general foreman, the superintendents and works manager were left out of the meetings except on special occasions. During the roundtable of discussion each man was asked to voice some suggestion as to how safety in the department could be improved.

The first meeting resulted in 15 sug-

gestions from the day shift, 14 from the night shift, and 12 from the dawn shift. Other suggestions followed at succeeding meetings as interest was aroused. The men were given to understand that every suggstion made in the meetings would be given prompt consideration. In every instance where suggestions could not be adopted, satisfactory reasons were given and those rejections were always submitted in a manner so as not to belittle the suggestion or cause embarrassment to the employee. It soon developed that the policy of giving prompt consideration or answer to all suggestions made by the men won interest and confidence, which is the first principle in salesmanship.

Friendly Meetings

Beginning with the third meeting the discussions were established on a congenial and friendly basis. It is thought that this genial atmosphere which was created was the greatest single reason for the cooperation shown.

At subsequent meetings each employee was given a copy of the minutes of the previous meeting, and a written report was submitted showing the action taken on each suggestion previously made.

It is interesting that early in the program certain personnel problems developed. There were in particular three individuals on two different shifts who gave evidence that they were not interested in the program or in promoting safty in this hazardous department. The personnel manager took prompt and decisive action in cooperation with the works manager. One man was fired; another was transferred; the third converted.

The safety inspector and the safety engineer spent at least one hour a day on each shift in the forming department in order to become intimately acquainted with each employee. The problems of the job were discussed and the safety engineer personally investigated the results of each suggestion which had been put into effect. A daily log was maintained of the activities of the safety engineer and safety inspector in the department and this has aided materially in giving a check on the mechanical conditions and various morale problems connected with the department.

It is significant that management and plant supervision cooperated wholeheartedly in this drive. It is believed that the program would have been ineffectual without this active support. It was necessary also to require the support and interest of the maintenance crew in order that suggestions and requisitions should be promptly and effectively completed. The meetings have been continued regularly.

Results Surprising

When the drive was started it was the expectation of management that possibly two or three of the more serious accidents which had been occurring regularly throughout past years could be eliminated. The results of the drive over a 12-months period ending Oct. 31, 1944, were beyond our fondest hopes and are as follows:

Instead of 44 accidents as in the year before last, there were 11. In place of lost time cases of 19, after the drive started there were none. In place of nine permanent injuries of the previous year there were none. In place of 23,512 man hours lost in the previous year, there were none. In place of $30,590 in indemnity and medical payments of the previous year, there was a total medical bill of $191.34.

The figures are startling. It can be truthfully said that almost any effort put out by management to promote safety will bring tangible returns, but I believe that the main success in this drive came from the fact that mangement realized it had a selling job to do. As a matter of fact, considering the broad field of management, that is probably management's chief function. Seldom is any active Management free from this necessary function. By the same token, the safety engineer and the safety inspector must be good salesmen. First, last and always, salesmanship must be present in dealing with human beings, including, as I have said, the activities of the insurance agents who descend upon unsuspecting management when a policy is about to expire.

The average man does not recognize the hazards of industrial life and even when these are understood by the few with greater intelligence, the safety engineer is confronted with such human characteristics as boldness, vanity, horseplay, carelessness, or the natural desire of one man to show off before his fellows. You are all familiar with the window washer who fails to fasten his safety belt; the tool maker who fails to adjust goggles; or even the practical joker who blows up a rubber seat cushion with acetylene gas, under a worker, and then ignites it with a match. Some of these things you cannot guard against except through salesmanship and arousing the interest of the employee.

Seller's Market? Yes and No, Find Electrical Appliance Manufacturers

JUST how long will the seller's market in home appliances last?

That question is being probed in a practical manner by several leading makers of electrical equipment, who are conducting "guinea pig" tests in some representative cities throughout the country in an effort to find out if all those names on dealers' waiting lists really mean anything.

General Electric, Silex, and Proctor Electric are three of the companies which have chosen certain cities in which to place a supply of products equal to or greater than the anticipated demand, in order to gauge accurately the actual market. Moving into a selected locale, some manufacturers are taking over the dealers' lists, and notifying each person listed that the appliance for which he indicated a desire is immediately available.

Results of the tests to date have shown two trends: in major appliances, such as ranges, refrigerators, and washing machines, the seller's market is here to stay for some time; in irons, toasters, electric pads and other items generally regarded as minor appliances, the demand is close to being satisfied. Refrigerators, it was found, made buyers out of more than three-fourths of the prospects; vacuum cleaners and radios ranged from a cold 20% to a lukewarm 50 or 60% in sales to prospects.

Silex has chosen Peoria, Ill., and its outlying areas as a test location, and has flooded the market there with irons and coffee makers. Company officials are sufficiently enthusiastic about the idea to schedule it on a two-year basis. They expect through this method to be able to judge the market potential six months in advance.

Proctor has been sampling Baltimore, Washington, Philadelphia, Boston, Richmond, and other large eastern cities. In Philadelphia and Washington, sales were heavy, but initial results in Baltimore showed a contrary trend. Tentatively, company representatives have predicted a swing from seller's to buyer's market before the end of the year.

Cheering news for old, established firms, and news indicative of growing discernment on the part of consumers is the failure of new, unknown brands to move off dealers' shelves.

Orifice Plates and Differential Connections

CONSIDERATIONS IN THE DESIGN AND INSTALLATION TO ASSURE RELIABLE FLOW METER READINGS

By
LOUIS GESS
and
R. D. IRWIN

THIS ARTICLE first appeared in the May-June issue of "Instrumentation," company magazine of the Brown Instrument Co., a division of Minneapolis-Honeywell Regulator Co. Both authors are Brown engineers. Mr. Gess was graduated as a mechanical engineer from the University of Michigan. Formerly instrument foreman with Detroit Edison Co., he joined Brown in 1927, where he is now in charge of the Application Engineering Section. Both men are ASME members; Mr. Gess has served since 1931 on its Special Research Committee on Fluid Meters.

THE orifice plate is the most common means for creating a pressure differential used in the measurement of a moving fluid in a pipe line. The satisfactory operation of an orifice type flow meter depends on how closely the coefficient of orifice discharge, empirically determined under almost ideal flow conditions, can be reproduced under actual installation conditions. Generally, if the orifice is properly made and installed, it is not difficult to obtain accurate and reliable flow meter readings. In addition to the orifice plate proper, the orifice connections or taps must be carefully installed. If such precautions are not taken, unsatisfactory operation is the general result.

The Orifice Plate

The orifice plate is a comparatively thin plate in which the opening or orifice is accurately machined within close tolerances. The upstream face of the plate shall be as flat as can be obtained commercially.

The orifice edge, on the upstream side of the fluid, must form as nearly as possible a 90° angle and be free from burrs and tool marks. There must be no machining operations which would tend to round the edge. In order that a sharp upstream edge will be retained in service, the plate must be made of a durable, corrosion-resisting material.

The thickness of the orifice shall be sufficient to prevent buckling under any ordinary differential pressure. Under extreme conditions, the thickness of the plate should be increased as required. The thickness of the plate is very critical at the orifice edge, and must not exceed the limits given below. Where extreme operating conditions require a plate of greater thickness, the downstream edge must be beveled at an angle of 45° or less to the orifice plate.

Plate Thickness Limits

1. 1/30 of the pipe diameter D.
2. ⅛ of the orifice diameter d.
3. ¼ of the dam height. $\frac{D-d}{2}$

The minimum of the above requirements governs in all cases for orifice plate thickness.

To conform with recommended practices, the orifice-to-pipe diameter ratio, d/D, should not exceed the limits listed below. In no case should an orifice be designed for a pipe having an I.D. of less than 1.610 inches, because of the wall roughness effect with small size pipes.

1. Vena Contracta Taps—4-in. pipe size and over, between 0.10 and 0.80 orifice ratio. For pipe sizes under 4 inches, the use of vena contracta connections are not recommended, because of interference between the flange and downstream tap.

2. Flange Taps—4-in. pipe size and over, between 0.10 and 0.75 orifice ratio; 3½-in. pipe size and under, between 0.15 and 0.70 orifice ratio.

3. Pipe Taps—4-in. pipe size and over, between 0.10 and 0.75 orifice ratio. 3½-in. pipe size and under, between 0.20 and 0.70 orifice ratio.

If it is necessary to use extremely high orifice ratios in small pipes, the orifice should be installed in the proper length run, and the coefficient of discharge calibrated in a hydraulic laboratory.

Effect of Temperature Changes on the Orifice

Regardless of the operating temperature at which the orifice plate is to be used, the manufacturing operations can be done only at existing atmospheric conditions. If the tem-

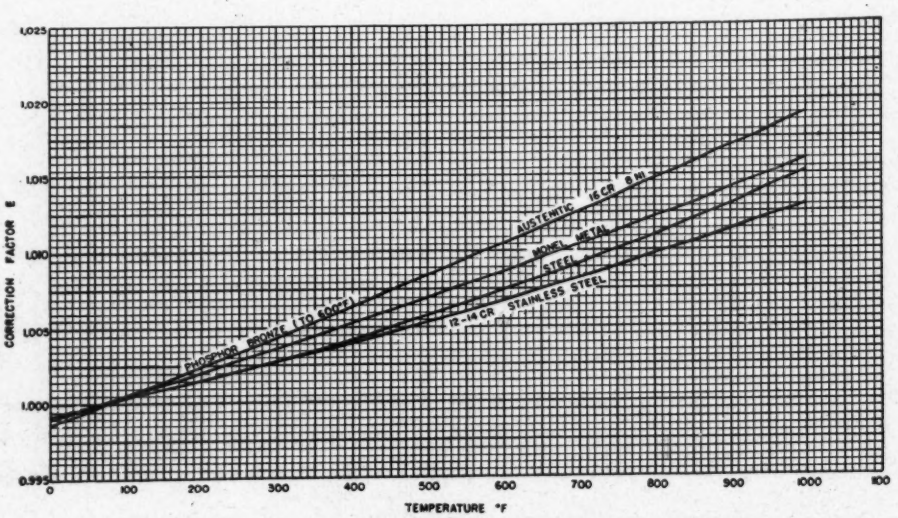


Fig. 1—Area Correction Factor for Thermal Expansion of Orifice

perature of the flowing fluid varies considerably from atmospheric, the resultant expansion of the orifice plate material will increase the opening beyond the calculated value. This increase in temperature will also cause an expansion in the pipe size, which is generally assumed to be at the same rate as that of the orifice. The result will be that any change in the ratio of the orifice pipe size from the calculated value can be neglected. On this basis, the only effect on the rate of flow will be the increase in the area of the orifice. The area multipliers or correction factors for thermal expansion of the orifice, under various conditions of temperature, are given in *Fig. 1.* This curve was prepared by the A.S.M.E. Power Test Codes Committee and is reproduced by permission from the original publication.

Installing Orifice Plate Between Flanges

In normal practice, the orifice plate is installed by insertion between flanges with gaskets on either side. The following precautions should be taken in making the installation:

1. The orifice opening must be correctly centered with respect to the internal pipe wall.

2. The gaskets must not cover part of the orifice opening or the drain hole.

3. If the beveled type, the bevel must be on the downstream side.

4. Flange bolts must be tightened evenly due to possibility of buckling the plate.

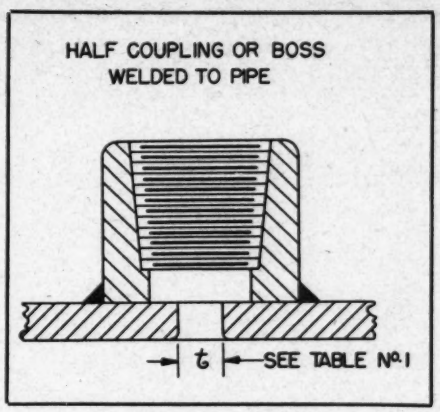


FIG. 2

Differential Connections

In the measurement of differential pressure, the pipe connections, called "taps," may be made at various points with respect to the orifice location. The four systems in use are known as "vena contracta," "flange," "pipe" or "full flow," and "corner" taps. The Brown Instrument Co. supplies orifices for only the first three types. In order to use the standardized A.G.A.-A.S.M.E. coefficients of discharge, the taps must be made correctly and located at the proper distance from the orifice plate.

General Specifications

On a theoretical basis, the tap may be located at any point on the circumference, provided a line through the center of this opening passes through the center of the pipe. Practice has shown, however, that certain locations, depending on the fluid being measured, are desirable. When liquids and steam are being measured, a horizontal connection is recommended. An exception is when the connecting meter piping is filled with a volatile fluid. In this case, it may be desirable to locate the tap not more than 50° below the horizontal, so that the connecting piping will not become gas bound.

For gas measurement, taps in the top of the pipe are recommended to allow moisture to drain back into the flow line. Since extraneous matter may be carried along the bottom of the pipe, taps in this location are not recommended.

Placing the Tap

1. Drill the pipe at the exact locations specified by the manufacturer for vena contracta and pipe taps.

2. The orifice nipple must not project beyond the pipe wall. Burrs, resulting from drilling or tapping operation, must be removed. Edges inside the pipe should not be perfectly sharp, but should be slightly rounded by using fine emery cloth. A recommended method of installation is shown in *Fig. 2.* The diameter of the opening through the pipe wall is tabulated in *Table 1.*

TABLE 1
Diameter of Pressure Taps

Nominal pipe diameter, in.	Maximum diameter (t) of pressure taps, in.
2	¼
3	⅜
4 and above	½

3. The hole should be tapped carefully, so that a line through the center of the orifice nipple passes through the center of the pipe.

Vena Contracta Taps. This type obtains its name from the fact that the low-pressure connection is located at the region of minimum pressure, which is the vena contracta. Location of the upstream tap is approximately one pipe diameter from the upstream face of the orifice. The distance of the downstream tap from the upstream face of the orifice varies with the orifice ratio. It is not always possible to locate the tap at the vena contracta, because of flange thickness. When the tap location is changed from that shown by the unity curve, the differential pressure measured by the meter is less than the theoretical value. Therefore, the coefficient must be multiplied by a correction factor obtained from *Fig. 3.*

An outstanding advantage of vena contracta taps is that flanges already installed can be used for holding the orifice plate. Also, use is made of the maximum differential pressure across the orifice.

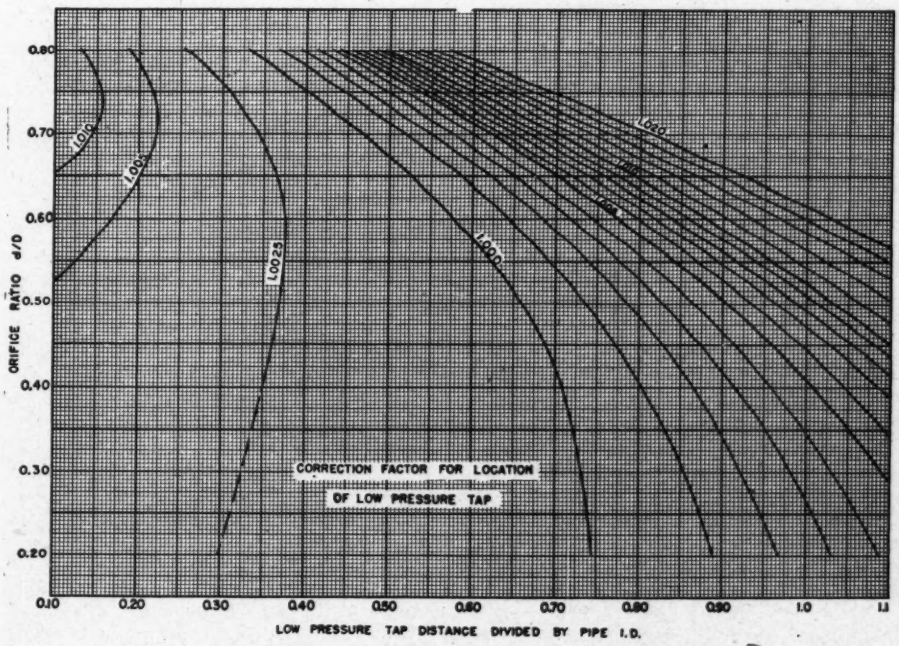


FIG. 3

Is THIS Panel Heating?

By ART THEOBALD, Chief Research Engineer,

Payne Furnace Co., Beverly Hills, Calif.

DURING the past few years there has been considerable interest in panel heating, most of which has been confined to wall, floor or ceiling panels warmed by steam or hot water coils imbedded in their surface. However, the importance of cold or warm walls has for many years been recognized by the heating industry. The following article was published in the Payne Pilot:

"Lets Talk About Register Locations"

"Where should heat be located in a room? Perhaps to be more correct we should say, from what particular point or points in a room should heat come to provide the greatest warmth to occuoants of the room?

"Different answers will undoubtedly be received, depending on whether the question is directed to an installer of steam, vapor and hot water systems, or to the warm air heating contractor. Even among proponents of either system, we are sure to find a variance of answers. Heating requirements, or architecture of a structure may often impose restrictions as to heat supply location; many contractors seem to place registers from habit. However, there are certain fundamental principles which should be adhered to, and we will try to cover the most important here.

What Is a Cold Room?

"This is not merely a rhetorical question. The answer is not so obvious as it seems, because a thermometer cannot tell the whole story. We have all been in rooms that felt cold to us, yet the thermometer read 70 to 74° as is theoretically right. Occasionally we have been completely warm and comfortable in rooms where the thermometer registered only 68°. Why this seeming inconsistency? The answer is found in the laws of heat radiation and heat flow and in the function of the heating system Mother Nature built into our bodies. This system is somewhat peculiar, in that it has no ability to strike an average. What we mean is that if our head and shoulders are warm, for example, and our feet and legs cold, the "comfort register" in our brains says we are "cold". It's the case of "one cold—all cold" like "one tie—all tie" in a golf game. Our "register" demands uniformly distributed comfort or it's not comfort at all.

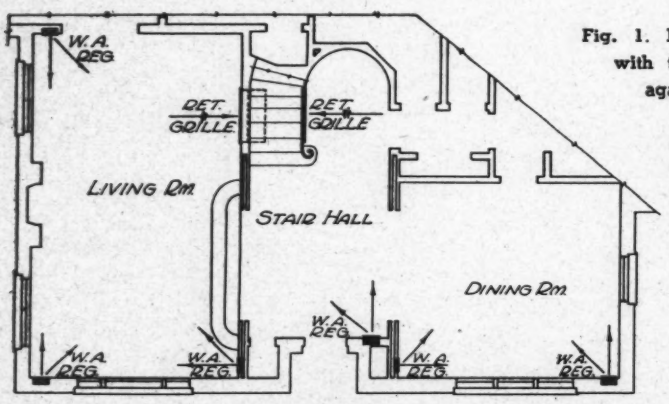
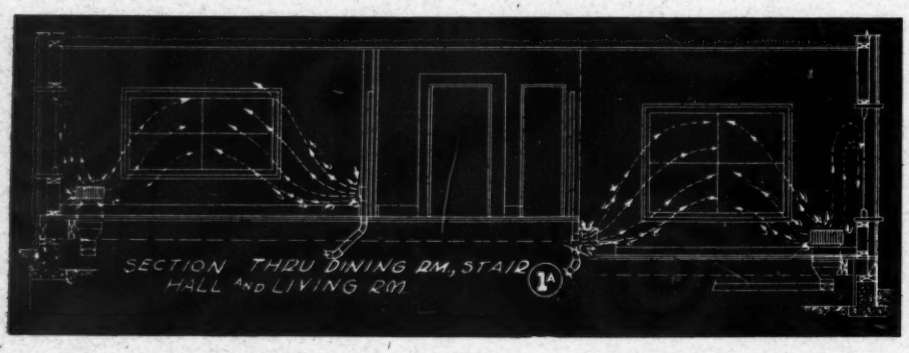


Fig. 1. Low register location, with the warm air playing against cold walls and windows. Circulation diagram below shows air flow. Note that the attack against cold air is directed against its place of entry.



What Is Comfort?

"We might say that the ideal comfort condition exists at a temperature that causes the body to radiate or give off heat normally in all directions at the same rate. That "give off heat normally" perhaps requires some explanation. The truth is that all comfort heating is in reality "comfort cooling". Everyone knows that we are ordinarily most comfortable in an air temperature of around 72°. Since the internal temperature of the human body is normally 98.6°, and at rest we are generating approximately 400 Btu. per hour, it is obvious that it is necessary to maintain a condition surrounding the body that will most uniformly dissipate the heat being generated; we must be cooled.

"Getting back to the first sentence in the foregoing paragraph, the most important part is the last seven words: "in all directions at the same rate". Heat flows from warm bodies to colder ones. Cold outside walls and glass tend to chill persons sitting near them. So if we sit, let us say, with our back to a cold wall, that wall takes more heat from our back than the room temperature takes from the front of our body. So, even though the room temperature may be over 70°, we have a feeling of cold or discomfort because both sides of our body are not uniformly radiating heat. Our brain "comfort register" emphasizes the worst and not the best condition.

A Definite Problem

"In order to make the foregoing of more than academic interest, suppose we keep the facts in mind and apply ourselves to a specific heating problem. Let us take the living room, dining room and hall of a ten-room house. The living room has 144 sq. ft. of glass and 276 sq. ft. of exposed wall. The ceiling is protected by a heated room above it, hence no loss there. Beneath the floor the prevailing temperature is 40°. Our aim is to make any spot in this room comfortable with mechanical warm air heating when outside temperatures range from plus 50° to 30°. The cold areas in the living room most likely to create a "cold 70" condition are ob-

viously the glass and outside walls. These walls and the glass area must be blanketed with a film of warm air if we are to achieve true comfort for the occupants.

First Solution

"Now take a look at Fig. 1, a layout of the rooms, and the accompanying Fig. 1A, diagramming the circulation. Glass and wall areas, and infiltration at windows and doors, cause over 85% of our heat loss, and our problem is to fight this loss at the point where it takes place. Note then the register locations in Fig. I. See how they blanket the windows and walls with warm air as a shield against outside cold. Being low the heat rises to cover the proper areas both by forced and natural circulation. Now this system is not ideal but it is practical, effective, and low in cost.

High Wall Location?

"We hear someone saying, "But why not high wall registers? That's the way we usually place them." Remembering this is just a friendly discussion, we'll say we're not for them, and we'll illustrate why. Take Fig. 2 and accompanying Fig. 2A, a conventional placing. Here we would be trying to battle the cold wall and glass and cold infiltrating air with registers high in the air and one register 15 ft. from the enemy. Why handicap our heated air by releasing it from 7 ft. 6 in. height? Warm air goes up at once. What effect would it have on the lower 5 ft. 6 in. of the room generally, and especially the 30° air that enters around the windows and drops immediately to the floor? And you cannot locate cold air returns under the windows to pull the warm air down over the walls and windows. You cannot "pull" warm air down—you would more likely increase cold air infiltration.

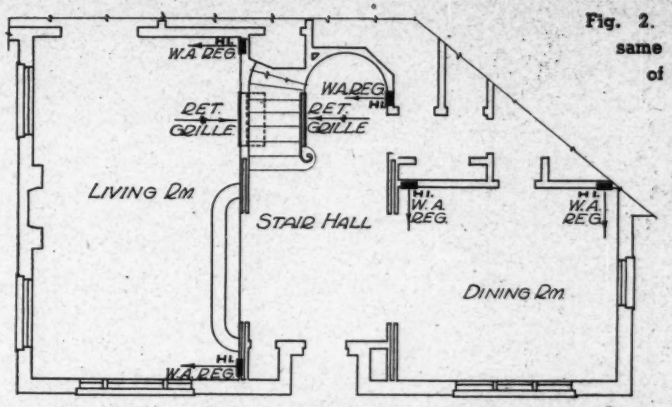
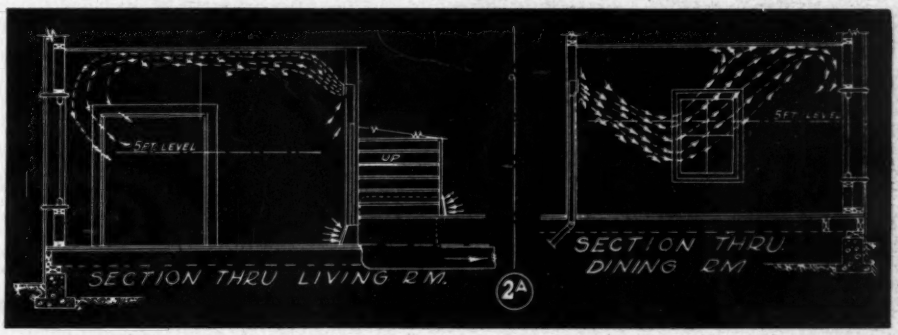


Fig. 2. This diagram of the same room shows location of a high wall system. The warm air tends to flow upward—above the heads of room occupants. Also it is not directed toward the windows or walls where the greatest cold area lies.



"Look to Figs. 3 and 3A for our last and favorite diagram for register locations. It would create an ideal condition and be highly effective. Note that our warm air is directed right against the coldest areas. The normal flow of air in the room would make for most even heat distribution. Should there be drapes over these windows, and they were drawn over the registers, they would not be injured but would cut off the glass area and the drapes would become a fine radiating surface."

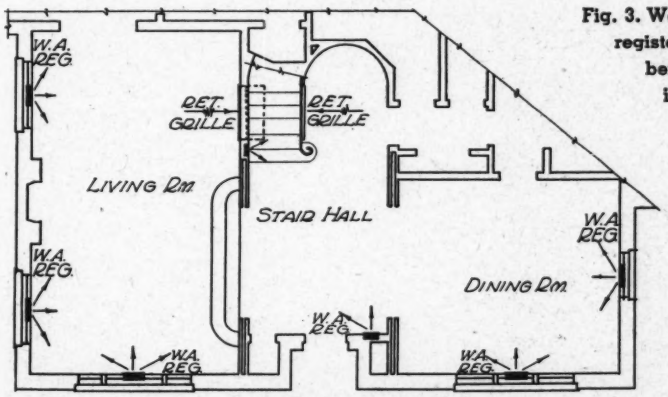
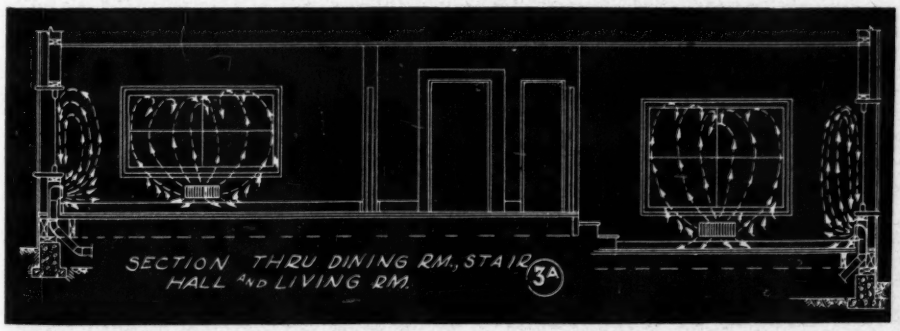


Fig. 3. We consider this the ideal register location — low and beneath windows where it can reach the coldest spots immediately and warm the air before it has a chance to reach occupants of the rooms. Note how warm air circulation blankets coldest areas of glass and walls.



In panel heating we are depending on the actual surface temperature of the panel to create the comfort condition within the heated spaces. Therefore, the problems involved are: (1) Which is the most economical and satisfactory way of heating the surface of the panel? (2) Which is the most important location for the panel? (3) How can all six panels surrounding a space be elevated to and maintained at equal temperature?

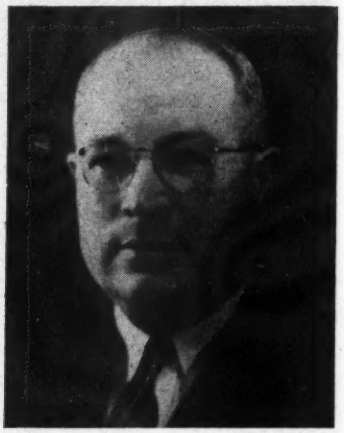
In answer to question No. 1, heat can be very economically transported from its source to the desired panel by laying a blanket of warm air over the surface of the desired panel.

No. 2. The panel most seriously affecting the comfort condition within the space is the outside walls and windows. Therefore, it would seem logical to treat them as primary panels rather than secondary.

No. 3. By applying the heating medium to the coldest panels surrounding a space where maximum heat is required, it would seem obvious that overall equilibrium could be more rapidly obtained and evenly kept.

H. W. EDMUND
President

R. N. DREIMAN
Convention Chairman

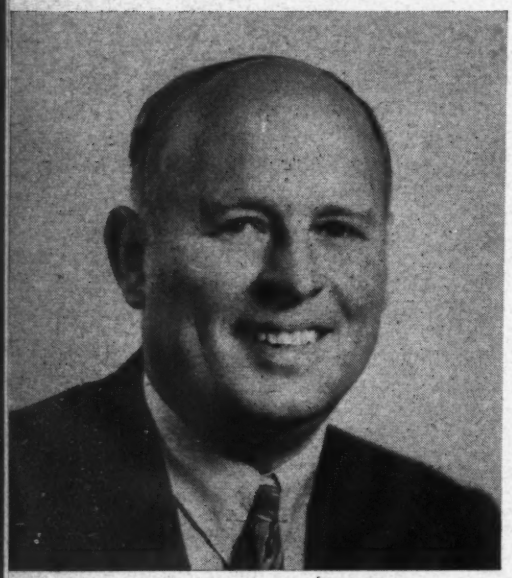


PCGA NOMINEES

In the Spotlight

53rd ANNUAL CONVENTION

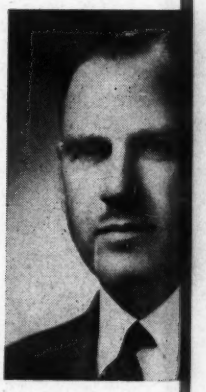
September 10-11



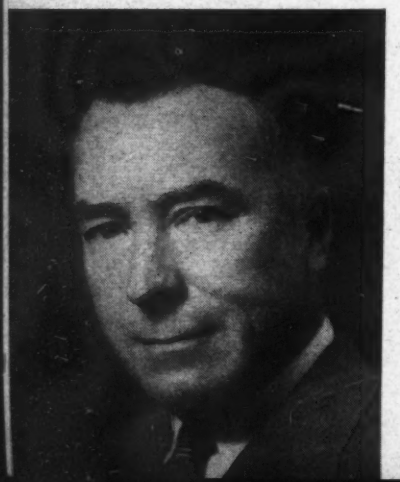
L. M. EDWARDS
Presidential Nominee

DIRECTORS

R. R. BLACKBURN



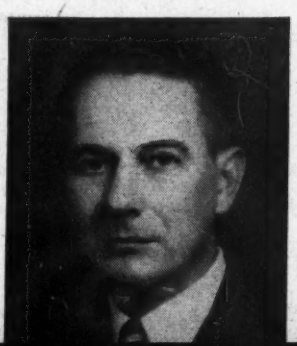
J. S. MOULTON



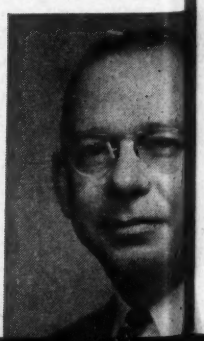
A. H. SUTTON
Vice-Presidential
Nominee

C. H. GUEFFROY

H. HONER



N. H. GELL



ASSOCIATIONS

PCGA Meet to Install Edwards

LEROY M. EDWARDS, vice president and general manager of the Pacific Lighting Corp., Los Angeles, will be nominated for president of the Pacific Coast Gas Association when it meets in its 53rd annual convention in San Francisco, Sept. 10-12. Edwards is incumbent vice president.

A. H. Sutton, president, Mission Appliance Corp., Los Angeles, will receive the nomination for vice president, and D. G. Martin, general auditor, Pacific Gas & Electric Co., San Francisco, will be named for treasurer.

Luncheon Meetings

Latest convention announcements by General Chairman Roy N. Dreiman have added two general luncheon meetings to the previously released program. These will be held Wednesday and Thursday, Sept. 11 and 12, in the Peacock Court of the Hotel Mark Hopkins. A third attraction will be the broadcast, "Breakfast on Nob Hill," on Wednesday and Thursday mornings, for which all space has been reserved for PCGA convention-goers.

Among the speakers who will be presented during the three-day meeting are H. Vinton Potter, A.G.A. New Freedom Gas Kitchen program director; J. E. Drew, assistant director of promotion for the A.G.A.; R. J. Canniff, Servel promotion manager; Carl Sorby, president of the George D. Roper Corp.; A. F. Bridge, vice president and general manager of the Southern Counties Gas Co., Los Angeles, and others.

Section Meetings

Thursday afternoon's section meetings are expected to draw widespread attention. The Accounting Section will hear Alden C. Fensel, director of research of the California Taxpayers Association, discuss tax trends. Group insurance problems will also come up for discussion. The latest twists in sales training, all year air-conditioning, and the newer uses of gas will be heard at the meeting of the Sales and Advertising Section. Plastic pipe installation, the mechanized operation of a distribution department, and an exposition of a new flooring material will feature the Technical Section meeting.

PCGA NOMINEES

General

President—LeRoy M. Edwards, vice president and general manager, Pacific Lighting Corp.
Vice President—A. H. Sutton, president, Mission Appliance Corp.
Treasurer—D. G. Martin, general auditor, Pacific Gas & Electric Co.
Directors (2-year term)—R. R. Blackburn, secretary, Southern California Gas Co.
N. Henry Gellert, president, Seattle Gas Co.
C. H. Gueffroy, vice president, Portland Gas & Coke Co.
J. S. Moulton, executive engineer, Pacific Gas & Electric Co.
Director (1-year term) — Henry Honer, president, Western Stove Co.

Manufacturers' Section

General Chairman—Henry Honer.
General Vice Chairman — C. A. Gabriel, Monarch Heating Co.

Accessories Division

Chairman — M. M. Kennedy, Domestic Thermostat Co.
Vice Chairman—J. F. Ray, General Controls Co.

Heating Division

Chairman—L. M. Hull, Hammel Radiator Engineering Co.
Vice Chairman—J. P. Tuck, International Sales Co.

Range Division

Chairman — R. S. Atchison, O'Keefe & Merritt Co.
Vice Chairman—W. M. Couzens, Gaffers & Sattler.

Water Heater Division

Chairman — R. H. Hinckley, General Water Heater Corp.
Vice Chairman—A. F. Rice, Rheem Manufacturing Co.

GAMA Directors

Henry Honer, C. A. Gabriel; alternates, M. M. Kennedy and R. H. Hinckley.

Connally Hot Oil Act Amendment Considered, Krug Tells Interstate Compact Commission

AMENDMENT of the Connally Hot Oil act to include natural gas and products derived from it is being considered by the Department of Interior, Secretary Julius A. Krug told the Interstate Oil Compact Commission meeting in Grand Rapids, Mich., August 10.

Secretary Krug declared emphatically that his office has no desire to supplant with federal supervision or control the present effective administration by state governments of oil and gas conservation laws.

He declared:

"In respect to the production of natural gas—a product assuming increasing significance as a fuel, as a source of important by-products, and as a raw material for synthetic fuels, lubricants and other hydrocarbon compounds — it is important to examine the application of conservation measures. The question as to whether or not the Connally act should be amended to include natural gas and the products derived from it, so that we could be of further help to the states in the enforcement of their conservation laws and regulations affecting natural gas, is being studied at the present time.

Shift Not Needed

"There is now no discernible need to shift the basic responsibility for conservation regulation from the states. A vast experience with conservation problems and a familiarity with local conditions make an effective state regulatory body the best organization to initiate and administer conservation codes. There can be no escaping, however, the very real interest that every American has in the oil and gas supply of the nation as a whole, or the fact that this interest has from time to time led to demands for independent federal regulation. I cannot, however, believe that these demands for federal regulation will ever become very intense so long as there is effective administration of conservation regulations by the states themselves.

"Not only must the conservation laws of the states be continued but they should be strengthened to meet the needs of the future. The states which have not adopted adequate legislation to prevent the physical waste of oil and gas—and there are a number of important states in that position—should renew their efforts to enact the necessary laws."

With reference to the controversy between the federal government and the states over title to submerged lands, much of which contains valuable gas deposits, Secretary Krug said:

Secretary of the Interior Julius A. Krug addressing Oil Compact Commission meeting.

"The federal government has never asserted title to or claimed ownership of lands underlying inland navigable streams or the coastal harbors or bays. That was not an issue, and the government has frequently reiterated its lack of interest in such lands. However, there has always been a legal doubt as to the title of the lands beyond low tide on the open coast. As trustee for the people, the Department of Interior felt it to be its duty to endeavor by appropriate means to find out who owned these lands and the minerals which they contain. The value of the lands and the minerals is believed to be great and thus a decision ought to be made quickly.

"The prescribed method for determining such rights is by application to the courts, and this has been done."

FPC Recommendation

Advisory committee of the Independent Natural Gas Association of America, in its report to the Compact Commission, pointed out that the most important of the current problems affecting the production, conservation, and utilization of natural gas is the recommendation of the Federal Power Commission which will be embraced in its report to Congress following the conclusion of its natural gas investigation which began in September, 1945.

Executive Committee of the Compact Commission voted not to submit another statement to the Federal Power Commission.

The Research and Coordinating Committee recommended that, in reporting natural gas production, all state regulatory commissions adopt a uniform pressure base, and that this base be that now used by Texas and Arkansas, where the base is fixed by statute.

Industrial and Commercial Section Outlines Plans for A.G.A. Convention in October

THE program of the Industrial and Commercial Gas Section for the forthcoming 28th annual A.G.A. convention, Oct. 7-11, in Atlantic City, is directed toward keeping gas men informed on future prospects as well as current developments in their field, Chairman Frank H. Trembly, Jr., announced last month.

Starting with a luncheon on Tuesday, Oct. 8 in the Rose Room of the Hotel Traymore, guests will be addressed by an outstanding industrialist whose topic will be "Future Industrial Production." Immediately following the luncheon there will be a section session. "Our Equity in Industry" will be the first talk of the afternoon by a utility executive. Of particular interest to commercial gas men will be a talk by I. S. Anoff of Food Service Equipment Industry, Inc., whose topic will be "A Modern Alliance." W. M. Jacobs of the Southern California Gas Co., will address the afternoon meeting on "Organizing for Accomplishment." Following his talk Eugene Milener of A.G.A. will tell of "Things to Come" in presenting the activities in Industrial and Commercial Gas Research.

The Section session will be continued on Thursday afternoon, when Leon Ourusoff will present "Objectives in the Food Service Field." Other topics will be "Standard Brass Foundry Practices as They Affect Gas Sales," by W. Wirt Young, and "Selling Gas for Firing Large Boilers," by L. S. Reagon, Webster Engineering Co.

Following these talks there will be a panel discussion on "New Developments in Industrial Furnaces and Ovens," presented by representatives of five furnace and oven manufacturers.

In connection with the convention, GAMA is planning an elaborate exhibition, with many of the displays promising to be on a scale equal to anything held before the war. One of the feature attractions will be a miniature compressor plant in operation.

Over 130 exhibitors have contracted for space at the convention.

CALENDAR

September

Sixth Annual Appalachian Gas Measurement Short Course—West Virginia University, Morgantown, W. Va., Sept. 9-11.

Pacific Coast Gas Association Convention—Fairmont Hotel, San Francisco, Sept. 10-12.

Midwest Industrial Gas Council—Radisson Hotel, Minneapolis, Minn., Sept. 12-13.

Controllers Institute of America—New York, Sept. 16-18.

Oklahoma Utilities Association, Gas Division—Biltmore, Okla., Sept. 20.

Association of National Advertisers—Atlantic City, Sept. 30-Oct. 2.

October

American Gas Association Annual Convention and Exhibit—Atlantic City, N. J., Oct. 7-11.

34th National Safety Congress and Exposition—Stevens Hotel, Chicago, Oct. 7-11.

American Trade Association Executives Annual Meeting—Hotel Carter, Cleveland, Oct. 11-12.

Midwest Gas Association and Iowa State College Gas School and Conference—Ames, Iowa, Oct. 28-30.

November

National Hotel Exposition—Grand Central Palace, New York City, Nov. 11-15.

National Metal Congress and Exposition—Atlantic City, Nov. 18-22.

December

American Society of Mechanical Engineers—New York, Dec. 2-6.

National Exposition of Power and Mechanical Engineering, Grand Central Palace, N. Y., Dec. 2-6.

Appalachian Short Course To Be Held in Morgantown

Over 50 problems in pressure regulation and quantity measurement will be explored during the three-day program of the sixth annual Appalachian Gas Measurement Short Course, to be held at the School of Mines of West Virginia University, Morgantown, W. Va., Sept. 9, 10, and 11.

J. M. Lowe

Experts from manufacturing companies and gas utilities will conduct the classes which will be held each afternoon, in three

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one-hour sessions. General sessions at which Joseph M. Lowe of the Hope Natural Gas Co., Clarksburg, W. Va., will preside, will occupy the morning hours.

Featured speakers at the morning meetings will be C. E. Nethkin, chairman, Public Service Commission of West Virginia, and J. French Robinson, president, East Ohio Gas Co. Robinson, former A.G.A. president, will discuss the FPC investigation of the gas industry.

Other morning topics will include industrial relations, fundamental gas laws, fundamental principles of displacement meters, as well as a film showing "The Tennessee Line," all scheduled for Tuesday. Wednesday's program will include a film, "A Date With West Virginia," and talks on pressure regulators and orifice meters.

Charles T. Holland of the School of Mines is handling accommodations for the conference.

Restaurants Combat Germ Menace With 180-Degree Hot Water

MODERN restaurants are making things hot for germs these days—180°, no less.

Hot water — super-hot, in fact — is the new weapon for combatting epidemics, which as a natural aftermath of war are a constant threat in still overcrowded areas. The swollen population, especially in urban areas, which has to be fed in a comparatively few restaurants has posed a worry to proprietors who are intent on preventing the spread of disease. Hot water, say public health authorities, is one of the most effective safeguards.

No amount of ordinary dishwashing and rinsing can effectively control the hoards of bacteria which swarm over dishes, tableware, and glassware. Public health men have estimated that dishes, knives, forks, spoons, and glasses, washed in the ordinary way, become carriers of diseases which cause from 35 to 45% of the deaths in the United States.

Low hot water temperatures, which may range at 140°, are satisfactory for washing floors, lavatories, and for other general uses, but 180° is needed to kill the majority of easily transmutable germs.

One of the simplest, most effective, and most easily enforceable means of protecting public health is the passage and enforcement of laws governing the temperature of dishwashing and sterilizing waters.

Restaurants Install Boosters

Already many leading restaurateurs have installed gas-fired superheating systems for their kitchens. Richlor's, Musso & Frank, Ollie Hammond's, in and near Los Angeles; Isbell's, Martini's, and some of the Thomson chain in Chicago, and many others in leading cities are using 180° hot water.

Shortly before the war, many communities had enacted laws stipulating that 180° water was to be used in public eating establishments for washing dishes, but curtailed production hampered the enforcement of such ordinances.

Boosting Methods

Several successful methods for boosting present water heating temperatures have been developed and are now available (see GAS, July, 1946, p. 66). Among these are gas-fired instantaneous type water heaters, recirculating boosters, and immersion tube burner type water heaters.

In immersion type heaters, gas is burned inside firing tubes which extend horizontally through the boiler shell containing the water. In this way, the combustion zone is completely surrounded by water, and the heat is transferred through the tube walls directly into the water.

The booster type employs one or more water heaters called "boosters" connected to the storage tank in which a reserve supply of heated water is maintained at a predetermined pressure. Hot water for rest rooms, washing pots and pans, and for similar uses can be drawn directly from the tank. However, when 180° water is needed for sterilization, this booster unit takes preheated water from the storage tank, and instantaneously raises it to 180°.

$6-Million Window Display

HERE'S a window display that cost over $6 million.

The girl operating the intricate machine, known as an alphabetical tabulator, is turning out that much money in the form of 200,000 checks. The seemingly endless reel carries the names of customers of the Public Service Co. of Colorado, Denver, and other retail companies in the Rocky Mountain area, and represents rate refunds for a 41-month period.

The refunds were made as a result of litigation over gas charges made by the Colorado Interstate Gas Co., Colorado Springs, to distributors. The money was impounded by the U. S. Circuit Court of Appeals until completion of the case, at which time the retroactive rate savings were passed along to consumers.

The crowd-attracting Public Service Co. window display was arranged by International Business Machine Corp. The machine, which was one unit of an assembly that computed, classified, sorted and addressed checks to all persons entitled to refunds, processed 1000 checks per hour.

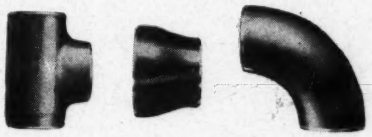
WALWORTH

Pipe Fittings

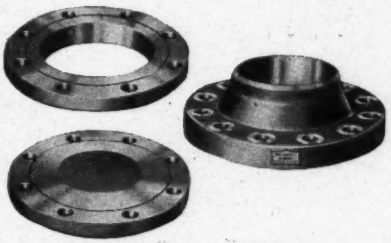
A complete line of standardized types in

STEEL
in series 150 to 1500

Cast Steel Fittings

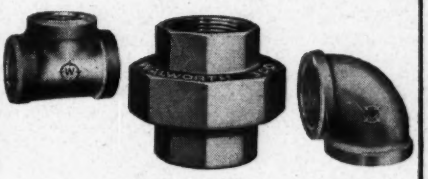


Steel Welding Fittings



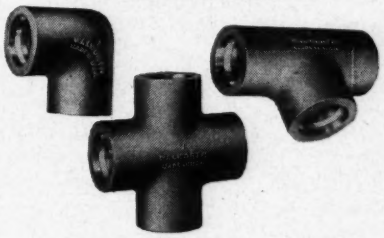
Forged Steel Flanges

BRONZE



125 Lb and 250 Lb, Screwed ends

150 Lb and 300 Lb Walseal ends

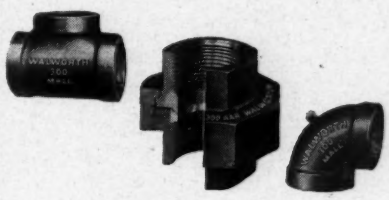


3,000 Lb O.W.G., Walseal ends

IRON

125 Lb and 250 Lb Cast Iron

150 Lb Malleable Iron



300 Lb Malleable Iron

Walworth's comprehensive line of pipe fittings is made in a wide range of types and sizes to meet every piping requirement. A few of the many regular Walworth fittings are illustrated above. All Walworth fittings are made to the highest standards of quality, both as to dimensional accuracy and metallurgical properties. In design, construction, and performance, they reflect Walworth's 103 years' experience in the manufacture of quality valves and fittings.

For detailed information on Walworth's complete line of valves, fittings, and pipe wrenches, see your local Walworth distributor or write for a free copy of Catalog 42.

WALWORTH
valves AND fittings
60 EAST 42nd ST., NEW YORK 17, N. Y.

LABORATORY CONTROL

To assure strict adherence to specifications, sample test bars of the metals from which Walworth Pipe Fittings are made are subjected to regular testing in Walworth laboratories These and other regular controls and inspections assure the high quality of all Walworth Pipe Fittings. The illustration shows a test on a cast iron transverse bar.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

British Develop New, Small

"SINGLE POINT" WATER HEATERS

PART 1. RANALAH G. H. 1 MODEL

THE Ranalah G.H. 1 instantaneous gas water heater is designed for use as a single point or small multi-point appliance to supply instantaneous hot water to a domestic sink, sink and basin, or two basins.

The appearance is modern and the result of close collaboration between the consulting designer and manufacturer, who between them have produced a pleasing design of robust utility and maximum efficiency. The streamlined case is vitreous enameled cream which will harmonize with practically all color schemes, but where required, and for a little extra cost, other colors can be supplied.

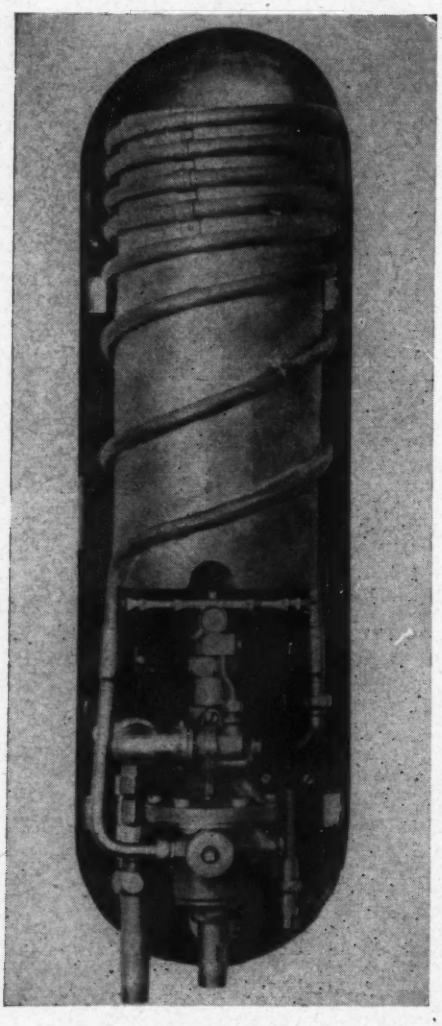


Fig. 1. Interior view, with jacket removed, showing construction and control detail of Ranalah G.H. 1.

Description

The automatic valve is operated by differential water pressures working on a rubber diaphragm. Incorporated in the lower half of the diaphragm chamber is the venturi tube and water throttle. The main flow of water to the heater coils passes through the venturi throat, and operates the automatic valve. Slow ignition is achieved by means of an adjustable check valve in the lower half of the diaphragm chamber, thus controlling the rate of opening of the gas valve. The flow of water through the heater can be pre-set to give the desired temperature rise by means of an adjustable water throttle located at the front of the water section.

The supply of gas to the burner is controlled by the incorporation of a constant volume governor, and safety in operation is obtained by means of a thermal cut off valve operated by the pilot flame.

Advantages

The outstanding points of advantage claimed for the Ranalah instantaneous gas water heater are:

(1) Gas supply to the pilot jet and main burner is controlled by a single positive action lever, this being the only manual control.

(2) After lighting the pilot jet, and moving the gas lever to the full on position, all further control of the heater is effected by means of the tap at the sink or hand basin.

(3) The burner is of advanced design which not only insures efficiency of combustion, but has proved by demonstration that blockage of flame orifices by deposit is largely eliminated, thereby reducing service calls.

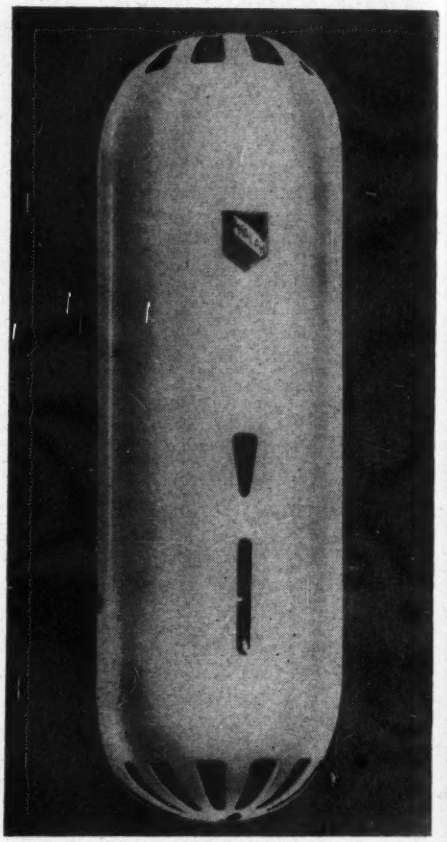


Fig. 2. External view of Ranalah G.H. 1.

(4) The water coils and heat exchanger are brazed to the body, thereby giving maximum strength, durability and efficiency of heat transfer.

(5) The extra large waterways not only permit the Ranalah instantaneous gas water heater to be installed in hard water districts, but at the same time reduce maintenance costs.

(6) All waterways are tested to 400 psi water pressure before leaving the works, and the heater will operate on all water pressures up to 250 psi.

(7) The heater is designed for limited multi-point use, and can be installed to suit the convenience of the user; it normally operates without a flue. The water and gas services can be connected either from behind or below the heater.

(8) The very low required minimum head of 6 ft. is of prime impor-

tance to both gas undertakings and potential users alike, as it will permit many more installations being effected which have hitherto been impossible, because of limitations to certain domestic supplies.

(9) The pilot flame is fixed or made adjustable simply by changing a screw.

(10) The heater is constructed to give free access for maintenance to all parts of the control and body. By releasing two unions the body is easily removed from the back plate without disturbing the control or service connections.

WHILE THE trend in this country is toward larger rather than smaller water heaters, there may be applications where the small or "single point" (installation at point of use) appliance could be advantageously used, and it is interesting to study latest British developments in this direction which exhibit both attractive appearance and ingenious design. One of the models described herein is an instantaneous heater, for use with sink or washbasins; the other is a two-gal. storage heater with four gal.-per-hour recovery capacity. The accompanying text, which appeared as two separate stories in the British journal "Gas Times," is presented exclusively in this country by GAS.

PART 2. S. 12/2 NEW WORLD HEATER

OVER a considerable period Radiation Limited has, through its associated companies, produced a steadily increasing annual output of single point storage water heaters, and it is therefore of interest that in anticipation of future requirements, a new model of this type has been developed, which is known as S.12/2 New World single point storage heater.

This water heater embodies proved features based upon district experience of large numbers of this type operating over long periods, under widely differing conditions of gas and water supply, and on schemes in which the extremely low maintenance cost has been subject to close actuarial supervision. Simplicity has characterized the design of these heaters, and records of their continuous use, year after year, and despite a minimum of attention, show freedom from complaint, and establish beyond all question their service value to consumer and gas undertaking alike.

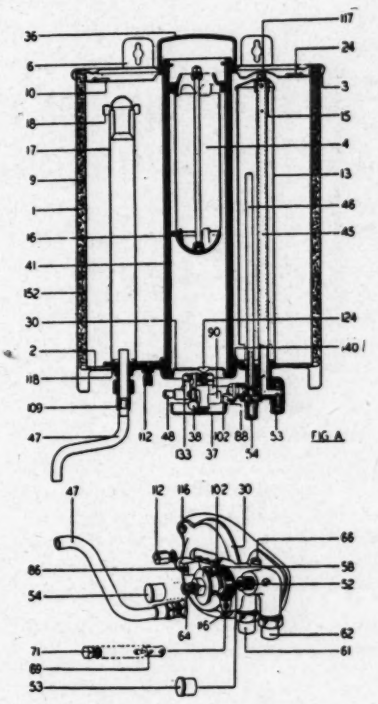
The New World single point storage gas water heater is essentially a two-gallon copper storage vessel with external lagging, and a vitreous enameled outer casing. The top of the storage vessel is closed by an inner close fitting lid (with loops attached for easy removal) and surmounted by a black vitreous enameled top cover. Through this storage vessel passes the combustion tube, consisting of a laminated asbestos cement tube which is sheathed in light gauge tinned sheet copper upon its water face. A removable baffle of cast iron and mild steel construction, treated with a highly resistant vitreous enamel coating insuring the long life of this component, fits within the combustion tube. This is a proved form of construction which eliminates condensate formation. The burner, which utilizes three Bray jets, is located toward the bottom of the combustion tube, and carries a small synthetic plastic dust tray. The top of the combustion chamber is covered by a neat plastic cap through which combustion products are directed forward in their passage.

Control of water temperature is by Regulo, with all the outstanding performance of that radiation instrument. The patent cleanable feature is incorporated, which permits *in situ* removal of the valve without disturbing the temperature setting. This feature has special significance from the maintenance aspect in that it facilitates the immediate removal of gum, etc., from the valve seatings. The Regulo silently and effectively controls the gas input, so that each withdrawal of water is accompanied by an increase in the gas consumption until the hot water withdrawn has been replaced. The correct gas rating is attained by operating the gas adjuster in conjunction with a pressure gauge temporarily connected to the burner pressure point.

External dimensions give the heater a minimum forward projection, and the design has a character which will harmonize with the most modern surroundings. Fittings are made as unobtrusive as possible, and by the introduction of a covered broken water feed, a balanced external appearance is produced.

The normal gas rating of the appliance is 6000 Btu per hour and the whole of the contents is heated to deliver two gallons at about 140° F within 30 minutes for the consumption

1. Outer case
2. Outer case baseplate
3. Outer case cover
4. Baffle
6. Wall brackets (bottom bracket not shown)
9. Water container
10. Water container cover
13. Water feed shield tube
15. Water feed tube thimble
16. Combustion tube sheath
17. Weir tube
18. Syphon cap
24. Lifting loop
30. Outer jointing flange
36. Flue cap
37. Dust tray
38. Trip lever handle
41. Combustion tube
45. Water feed tube
46. Thermostat tube
47. Outlet spout
48. Pressure point
52. Water adjuster
53. Water adjuster cap
54. Thermostat adjuster cap
58. Thermostat cover
61. Gas inlet union
62. Water inlet union
64. Temperature adjuster
66. Fixed by-pass screw
69. Gas filter
71. Gas filter cap
86. Burner without automatic cut-off gas valve
88. Gas adjuster
90. Burner with automatic cut-off gas valve
102. Nuts for securing burner to thermostat
109. Swivel spout union
112. Drain cap



116. Nuts securing outer jointing flange
117. Securing nut for water feed shield tube
118. Outlet spout locknut
124. Automatic cut-off gas valve
133. Bray jet
140. Jointing ring for combustion tube
152. Insulation

Fig. 3. Cross section detail of New World Heater.

of about 3000 Btu. The contents of the appliance are maintained at full temperature with a gas consumption of about 500 Btu and two gallons of hot water are available at any moment for instant use. This heater is notable for its freedom from valves dependent upon water pressure, and in the hottest or coldest weather water delivery temperature is constant and certain, while abnormally low maintenance, and low maximum gas rate insure certain result with little demand upon the gas services.

Safety Cut-off Valve

A safety cut-off valve is available for this heater as an extra. This device, of robust construction and positive action, is embodied within an easily removable burner which is interchangeable with the standard type. It consists of a bimetallic strip of hairpin form, heated by contact with the flames, which bends and opens a main valve, keeping it open so long as the heat is applied. A trip lever serves to set the valves open initially for lighting.

The S.12/2 New World single point gas storage water heater is claimed to be an ideal appliance for the user by virtue of its certain and economical service and good appearance, and for the gas undertaking because of its extremely low installation and maintenance cost, and its ability to provide a highly acceptable and economical increase in the gas water heating load without the embarrassment of peak load gas supply difficulties, and with freedom from the problems attendant upon fluctuating water pressure.

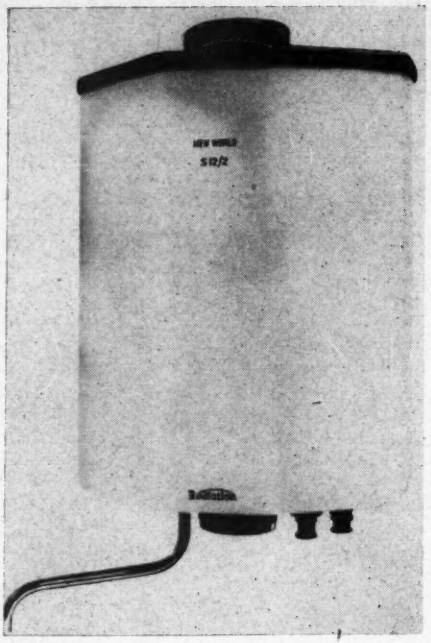


Fig. 4. External view, the New World Model.

Use of Helium to Trace Migrations of Hydrocarbons Declared Success

MIGRATIONS of hydrocarbon fluids in underground structures—a major problem in oil and gas production, recently underscored by the increased use of natural gas for recycling and for pressure maintenance in the fields—are now traceable by the use of helium, the Department of the Interior has announced.

Termed by Dr. R. R. Sayers, director of the Bureau of Mines, as one of the most remarkable advancements in recent years in the petroleum and natural gas industry, the success of the use of helium has been recognized after a series of tests made by the bureau in the Elk Hills field, Naval Petroleum Reserve No. 1, in Kern county, Calif.

Tested for a Year

In a report issued by the bureau, results of a year's testing in the Elk Hills field are detailed, together with descriptions of other types of work in charting subsurface oil and gas reservoirs. The report was issued late in July, concurrently with a paper titled "Improved Apparatus and Procedure for the Determination of Helium in Natural Gas," which described the sensitive instruments used in making the tests.

Elk Hills was selected as the guinea pig for both the test and the apparatus, it being the first field to undergo the experiments. The navy cooperated in the work.

The two bureau publications were prepared by E. M. Frost, Jr., chemical engineer at the Amarillo (Texas) Helium Plant, which is operated by the Petroleum and Natural Gas Division of the bureau. Frost invented the helium analysis apparatus and also took part in the Elk Hills work.

R. A. Cattell, chief of the Petroleum and Natural Gas Division, first conceived the idea of employing helium as a tracer because this gas is chemically inert and does not lose its identity by combination with reservoir rocks or fluids. The lack of a rapid and accurate method for determining helium content in natural gases, however, was seen as a possible deterring factor in the development of a tracer process using helium.

Frost's invention not only overcame this difficulty, but also provided equipment that was portable and had far greater sensitivity than previous apparatus. The time of analysis was cut from the former 40 minutes per sample to less than 10 minutes, and samples containing a few thousandths of a per cent of helium were analyzed as readiiy as samples containing one per cent or more. This range was not possible with former equipment.

Two Men Cited

In recognition of these two outstanding developments in the use of helium, both Cattell and Frost, during May, 1946, received the highest possible cash payments—$1000 each—and citations from the Department of the Interior suggestions committee.

As a preliminary to the injection of helium into the 43,000-acre Elk Hills field, natural gas from producing wells first was checked carefully for helium content, the portable analysis equipment greatly expediting this portion of the work. Even in the field, this apparatus detected traces of helium lower than 0.001%, and results often were checked to 0.0001%.

Copies of the two helium publications, Report of Investigations 3897, "Helium Tracer Studies in the Elk Hills, Calif., Field," and Report of Investigations 3899, "Improved Apparatus and Procedure for the Determination of Helium in Natural Gas," may be obtained free by writing to the Bureau of Mines, Department of the Interior, Washington 25, D. C.

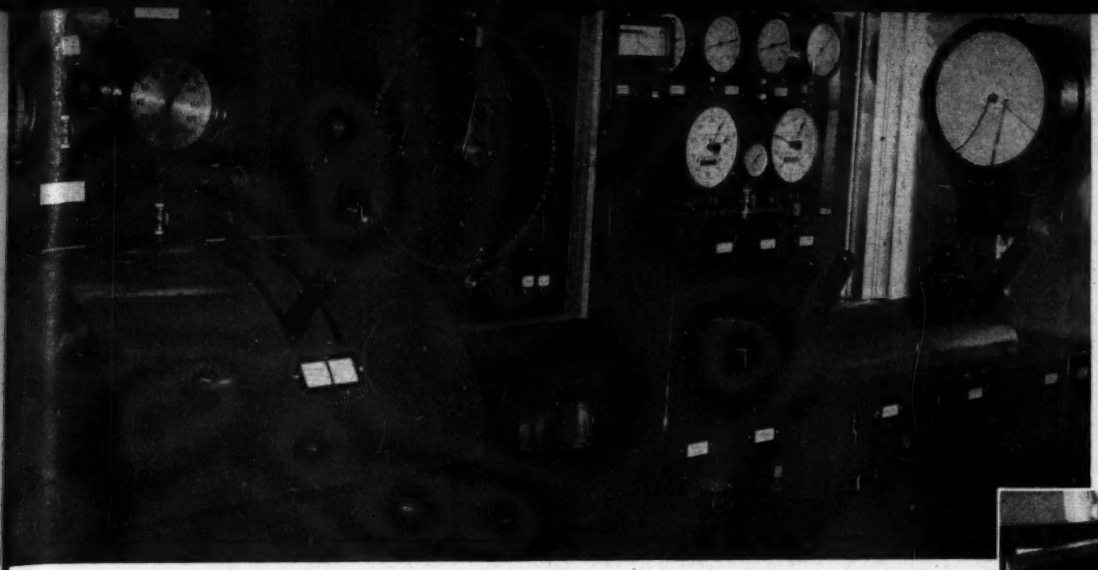
"Meter Jumping" Approved As Emergency Measure

Californians can now start "jumping meters," and with official blessings.

As a temporary emergency measure to ease the gas meter shortage, the California Railroad Commission has authorized unmetered service to certain customers under certain conditions. The ruling became effective August 1.

In all cases, the removal of meters must be done only with the consent of the customer, and at no removal or installation cost to him. Customers who for a period of two months or more have not exceeded the minimum charge are eligible, and may be billed on an unmetered basis the amount of the minimum charge. Other consumers who have used the service continuously for 12 months or more may be billed for unmetered service in monthly amounts identical with corresponding months during the previous period.

Non-residential consumers may also be affected.



In the center is the electrical timing unit, with the electrical contact points arranged in a circle. To the left are the two levers which operate the stack (left) and blast (right) valves. These two levers are interlocking, and it is mechanically impossible to open the blast valve when the stack valve is closed.

When the generator is not in operation, the levers are in their present position, indicating that the stack valve is open and the blast valve is closed. The three gauges directly above the blast and stack valve levers are master pressure gauges for oil, steam, and hydraulic water (reading from left to right).

The four levers to the right (reading from left to right) operate the purge, make-oil, heat-oil, and spray-steam valves. The two gauges directly above are oil counters or oil meters, which indicate the amounts of oil used in the generator. The four gauges above the oil counters (reading from left to right) indicate purge-steam, make-oil, heat-oil and spray-steam pressures. On the wall to the far right is the telltale, which indicates whether the stack, scrubber, and two blast valves are open or closed.

FIG. 1. Above—A view of the panel of the automatic gas-making control.

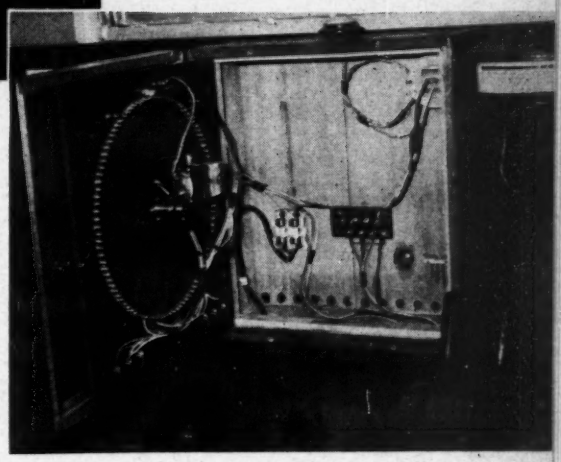


FIG. 2. Below—View showing the hook-up of the dial. A synchronized motor drives the dial hand by means of a worm gear. A door bell transformer (inside the box, upper right) provides the necessary current for the operation of the door bell (on top of the dial box).

Semi-Automatic Gas-Making Control

By LAURAN CLAPP

San Diego Gas and Electric Company.

TO aid in removing the element of human error that frequently creeps into timing the gas-making process, the San Diego Gas and Electric Co. has designed and built a semi-automatic gas-maker control. The control, which can be built for approximately $500, times the gas-making process as well as opens and closes the necessary valves.

Housed in a balcony adjacent to one of the company's large gas machines, the automatic control unit was designed by Superintendent of Gas Production, Riley Chambers, and was built under the direction of assistant Joe Merrill.

The heart of the control unit is a large dial. (Fig. 1). A hand, driven by a synchronized motor, rotates clockwise around the face of the dial; in doing so, the hand makes an electrical contact with a series of points on the outer edge of the dial.

One revolution of the hand represents a complete cycle in the heating and making of a generator full of gas. The cycle is completed in 11 minutes; 5½ minutes are required for the heating period and 5½ minutes for the making period.

Starting at the top, the hand sounds a bell which tells the operator to open the blast and stack valve levers (shown in the picture to the left of the dial). As the hand moves from left to right, there is a short dry-blast period of ¾ minute. The hand then strikes the electrical contact which opens the heat-oil and atomizer or spray-steam valves. When the hand approaches the down position, the electrical contact is broken and the heat-oil and spray-steam valves are shut off. A bell also sounds to tell the operator to close the heat and stack valves. After a few seconds, the hand makes an electrical contact which opens the make-oil valves. These valves remain open until the hand approaches the top and the electrical contact is broken. The purge-steam valve is then opened, and when the hand reaches the top position this valve is shut off and a bell sounds to tell the operator to open the blast and stack valves preparatory to a new cycle.

The speed of the dial arm may be changed by changing the gears operating the dial. The coupling or uncoupling of contact points will shorten or lengthen the various phases of the cycle. For example, by uncoupling the contact points near the bottom of the dial the heating period may be shortened; coupling additional contact points will lengthen this phase. This permits one phase to be lengthened or shortened independent of the timing of other phases. Fig. 2 shows details.

The electrical contacts made by the dial actuate magnet air pilots (Fig. 3) which, in turn, release air to operate Bristol synchro diaphragm valves (Fig. 4) which turn on the heat-oil, steam-atomizer, make-oil, and purge-steam. Breaking of the electrical contact releases the air and the valves are closed by springs. Operating in conjunction with the Bristol diaphragm valves are Hancock Flo-trol valves which accurately control the quantity of oil allowed to flow through the valves within any given period of time.

Only twice during the process is manual operation necessary, once to

FIG. 3. The electrical contact made by the dial hand actuates these magnetic air pilots.

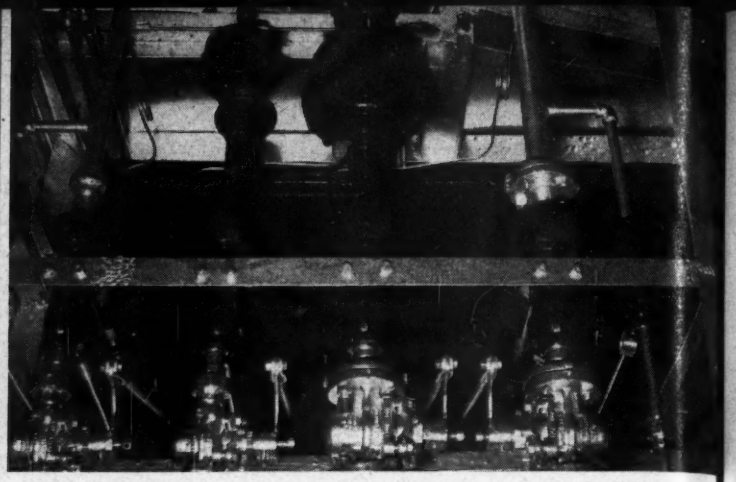


FIG. 4. The magnetic air pilots release air to open the Bristol synchro diaphragm valves, which turn on the heat-oil, steam-atomizer, make-oil, and purge-steam.

open the stack and blast valves at the beginning of the dry-blast period, and once to close these valves at the end of the heat period. The stack levers are interlocking so that it is impossible to close the stack valve with the blast valve open. On the wall to the right of the control room is a telltale, which indicates the open or closed positions of the stack, scrubber, and two blast valves. Directly under the telltale is a separate control board containing four manual handles for the operation of the purge, make-oil heat-oil, and spray-steam valves. By adjusting a bolt in the diaphragm valves the automatic feature is eliminated and the gas-making process may be operated manually.

By use of the automatic control new employees can be trained in the manufacture of gas. During the summer when the company's generators are ordinarily inactive, the generator burners are removed; a by-pass is provided for the return of the oil to the sump, and employees may go through the entire process of gas-making, even to the point of operating the levers and taking the necessary readings from the gauges.

In constructing this unit the major item of expense is the valves. The valve levers, their cowlings, and the entire control board panel were built in the company's sheet metal shop.

Oklahoma Well-Head Price Fight to Be Resumed Sept. 9

THREE states, Oklahoma, Kansas and Texas, are watching with interest the hearings before the Oklahoma Corporation Commission in which the commission is asked by the Peerless Oil & Gas Co. and two intervenors, the Oklahoma State School Land Department and gas royalty holders in Texas county, Okla., to fix the well-head price of natural gas in the Guymon sector of the Hugoton field at 10 cents per Mcf. The Hugoton field extends into sections of each of these states.

Following several days of hearings, which were resumed July 9, the sessions were again continued to Sept. 9. At that time the Cities Service Gas Co., which is defendant in the application, will present its testimony to support present prices being paid by the company in the field, which average about 4.5 cents.

The interest of adjoining oil and gas producing states lies principally in the fact that if the Oklahoma Corporation Commission fixes a field or well-head price for natural gas, pressure may be brought on the regulatory bodies of those states to fix such prices if the Oklahoma commission increases the present rates.

The hearings started last May 8 as a legal controversy between the Peerless Oil and Gas Co. and the Cities Service Gas Co. The former company asked the commission to require the Cities Service Gas Co. to connect with its wells and pay six cents per Mcf for it, and requested the commission to fix a well-head price higher than that.

One phase of the battle was temporarily settled during the recent hearings when the Cities Service Gas Co. advised the Oklahoma commission that it was making connections to two of the Peerless Oil and Gas Co. wells in the Guymon field at 4.5 cents per Mcf. If the commission should increase the field price Peerless would be paid the difference retroactive to the time of first runs.

The Oklahoma State School land department, when hearings were resumed July 9, filed a petition of intervention alleging that it owns and controls in the name of the state 49,000 acres of school lands in Texas county, Okla., and that 30,155 acres of this land in the Guymon field are under oil and gas leases. Of these holdings 6099.92 acres are producing gas which is being sold by lessees at an average of 4.5 cents per Mcf.

Real Value Debated

Aside from legal issues, the controversy in the July hearings hinged on rival claims as to what is the real value of natural gas at the well-head in the Guymon sector of the Hugoton field. The state school land department introduced evidence seeking to prove that, compared with Oklahoma mined coal of 11,500 Btu value per lb., selling at the mines at $5.31 per ton, natural gas in the Guymon sector of the Hugoton field is worth 23 cents per Mcf. Assuming another grade of Oklahoma coal, with 13,500 Btu content per lb., to be selling at $7.35 per ton, comparative value of natural gas in Guymon was estimated at 27 cents.

The Peerless Oil & Gas Co. presented testimony by M. L. Mayfield, Houston, petroleum and natural gas engineer, that to produce and sell natural gas in the Guymon field for less than 10 cents per Mcf constitutes economic waste. Prevailing market price in the field ranges from 3.6 to 5 cents per Mcf, Mayfield testified.

Walker T. Pound, chief conservation officer of the Oklahoma commission, recommended to the commission a price of 10 cents. Pound said that methods of well completion in the Guymon field are creating waste-popping of gas into the air.

Cities Service Gas Co. is expected to bring witnesses before the commission when hearings resume on Sept. 9, to support its contention that the present going price in the Guymon field is fair to all concerned and does not foster waste.

. . . the Common Name on Gas Plant Piping

This carbureted water gas plant, for example, shows how completely the Crane line serves the gas industry. From generators to storage holders . . . the valves and fittings, pipe and piping accessories . . . all can be supplied *on one single order* . . . by your Crane Branch or Wholesaler.

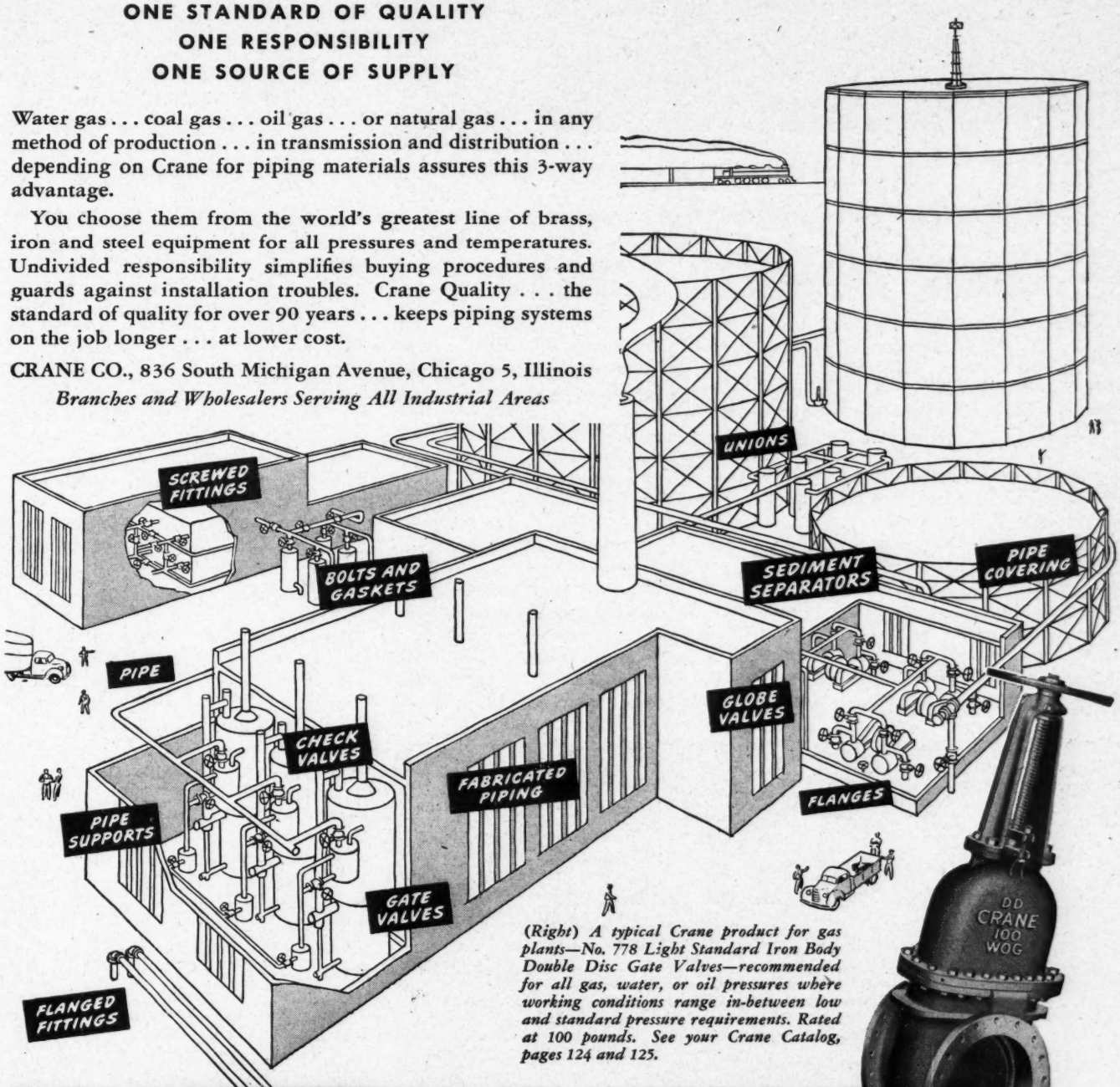
ONE STANDARD OF QUALITY
ONE RESPONSIBILITY
ONE SOURCE OF SUPPLY

Water gas . . . coal gas . . . oil gas . . . or natural gas . . . in any method of production . . . in transmission and distribution . . . depending on Crane for piping materials assures this 3-way advantage.

You choose them from the world's greatest line of brass, iron and steel equipment for all pressures and temperatures. Undivided responsibility simplifies buying procedures and guards against installation troubles. Crane Quality . . . the standard of quality for over 90 years . . . keeps piping systems on the job longer . . . at lower cost.

CRANE CO., 836 South Michigan Avenue, Chicago 5, Illinois

Branches and Wholesalers Serving All Industrial Areas



(Right) A typical Crane product for gas plants—No. 778 Light Standard Iron Body Double Disc Gate Valves—recommended for all gas, water, or oil pressures where working conditions range in-between low and standard pressure requirements. Rated at 100 pounds. See your Crane Catalog, pages 124 and 125.

EVERYTHING FROM . . .

VALVES • FITTINGS
PIPE • PLUMBING
HEATING • PUMPS

CRANE

FOR EVERY PIPING SYSTEM

Home Planning Bureau of New York and Richmond Gas Co. in Staten Island, N.Y.

New York and Richmond Gas Company's

HOME PLANNING BUREAU

By C. A. KENNEDY,

New York and Richmond Gas Co, Staten Island

ON Feb. 20 we opened a "Home Planning Bureau" in our main office showroom at Stapleton, Staten Island. The purpose of this project was twofold: first, to obtain a list of future gas appliance sales prospects and, secondly, to promulgate community goodwill and successful public relations for our organization.

The story of the formulation of our Home Planning Bureau adheres to the familiar theme of all program promotion. We started with the adoption of a comprehensive all-gas merchandising plan offered by the Surface Combustion Corp. This vehicle utilizes for physical background a panel and floor display of the Diorama Corp. of America. Thus having selected our general overall package plan and having placed our order for the necessary showroom material, we proceeded to prepare the community for the acceptance of our enterprise.

Since architects, builders, and banking institutions are the main cogs in the home construction machine, Richard Plata, our Home Planning manager, decided to contact personally all outstanding local men engaged in these businesses. In order to present a clear picture of just what we intended to develop, he showed a photograph of our contemplated display to all people whom he visited, and illustrative pieces of home-planning literature were mailed to each architect, builder, banker, and dealer. With this material we included an explanatory letter selling the idea of a Home Planning Bureau as a community project which would benefiit the entire county. In the case of closely cooperating individuals such as the advertising manager of our local newspaper, we held a special showing of sound-slide film pictorializing a Home Planning Bureau in action.

Official opening of New York and Richmond Gas Co.'s Home Planning Bureau Feb. 20. H. Carl Wolf, A.G.A. Managing Director cuts the ribbon; to his right, John Kohout, NY&R president.

Exhibits

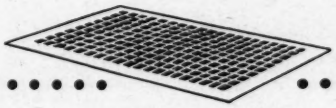
With the building and mortgaging interests in the community solidly behind us, we proceeded to advertise the forthcoming opening of our bureau and at the same time invited architects, building contractors, and banks to exhibit samples of their products and descriptive literature of their activities. Needless to say, the banks sent us only literature—no samples! National manufacturers and magazines were found very receptive to the suggestion of furnishing home planning publications and equipment.

The program of our Home Planning Bureau is extensive. Not only does it provide help in various phases of home planning, kitchen modernization and other home facilities, but it will conduct numerous forums on subjects of interest to home planners throughout the year. Special events will be held in addition to forums, such as, "Meet Your Architects Day," "Meet Your Bankers Day," and "Meet Your Builders Day."

During the time we have been in operation, we have experienced an unprecedented demand for the necessary appliances to create "All-Gas" homes, and the number of requests for house heating alone is far beyond all expectation. The A.G.A. promotional activities in kitchen planning are admirably suited to our own endeavors and form a perfect tie-in with the kitchen planning function of our Home Planning Bureau.

A number of visitors who were previously quite sold on other fuels decided to place orders for new gas appliances before they left our showroom. However, the emphasis throughout the entire operation of the bureau is less on gas merchandising and more on community service. We find that as our public goodwill expands, so does the use of the "Blue Flame."

MORE THAN 350,000 WARDS IN USE



...and giving dependable service!

THE WARD FLOOR FURNACE is "built to last a lifetime!" Wards that were installed many years ago are still delivering their full quota of healthful heat—at low operating cost.

This explains the enthusiasm of Ward owners and dealers. It explains why Ward is considered the standard by which floor furnaces are judged, in every area where it is sold.

Every detail of Ward design and construction is *right* because there's a third of a century of floor furnace experience back of every Ward. Ward pioneered many of the advanced features that have made the floor furnace the efficient, economical appliance it is today.

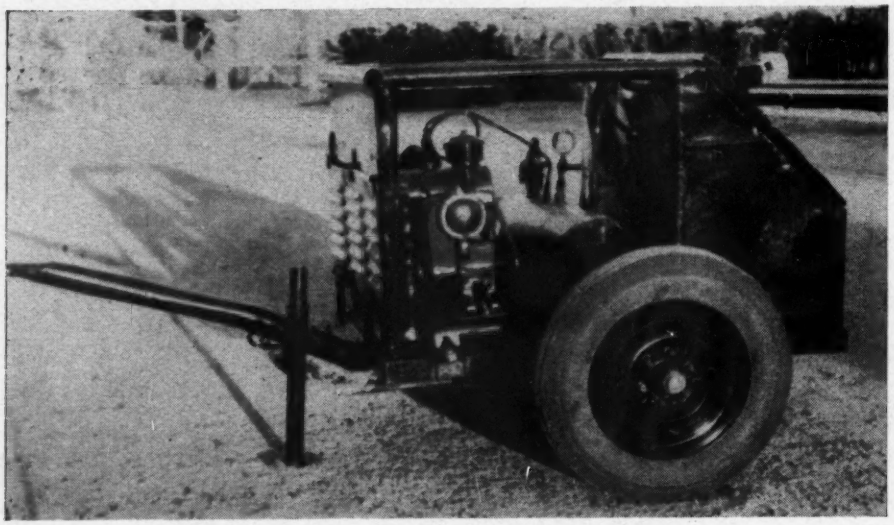
At the present time, the demand for Wards far exceeds our production. However, we hope to be able shortly to increase our delivery quotas and eventually offer additional dealers the sales advantages of Ward Floor Furnaces.

37 YEARS OF "KNOW-HOW"

WARD HEATER COMPANY

1800 WEST WASHINGTON BOULEVARD : LOS ANGELES 7, CALIFORNIA

OPERATING IDEAS



Portable Trailer for Painting in the Field

W. G. D. McELRATH, Tucson district Supt., El Paso Natural Gas Co., Tucson, Ariz.

Designed for use in painting maintenance line gate valve assemblies, pipe spans and structures, metering stations, and most equipment used in transmission departments, the trailer provides a complete, portable painting outfit in a single piece of equipment. It is equipped with a receiver with safety valve and a small air compressor, driven by a gasoline motor.

Contained in the trunk compartment are two 1-qt. spray guns. There is also ample space for paint, thinner, rags, and other supplies and tools needed for a complete paint job. As an extra feature, the trunk carries an air hose and gauge for use in repairing auto tires while on the line, as well as maintaining tire pressures in heavy rolling equipment.

The motor, compressor, and receiving tank are mounted on a skid frame which can be detached from the trailer and carried to sections of the line where the trailer could not travel, or to the interior of the shop for use in painting equipment.

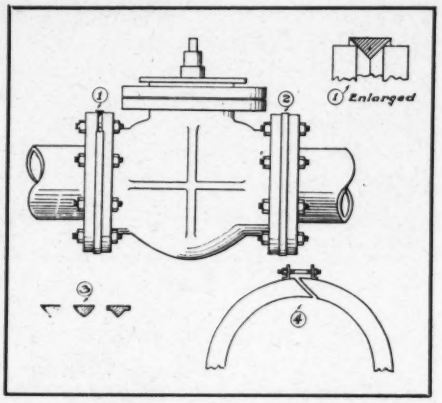
The unit is in general use in the transmission department of Tucson district of the El Paso Gas Co.

Flange Bolt Protector

T. C. SHEPHERD, chief engineer at Houstonia, Mo., for Panhandle Eastern Pipe Line Co.

This protector is being used successfully on a discharge header at Panhandle's Houstonia station. After the gadget is installed properly and the bolt is treated with any rust preventive, it should last indefinitely. The gasket will make a perfect seal as far as water is concerned. It can be used on all flanges, especially around a cooling tower, main line gates or river crossings.

In the accompanying diagram: (1) Indicates rubber installations. (2) Shows rubber installed. (3) Illustrates different types and shapes of rubbers that may be needed for different size valves and flanges, due to space between flanges. (4) Shows gasket properly cut on an angle. Either a stove bolt clamp as illustrated or some quick acting lever type clamp can be used. In new construction the clamp can be made in one piece, the tension made by stretching to install over the flange.



Traveling Crane For Handling Gas Pipe

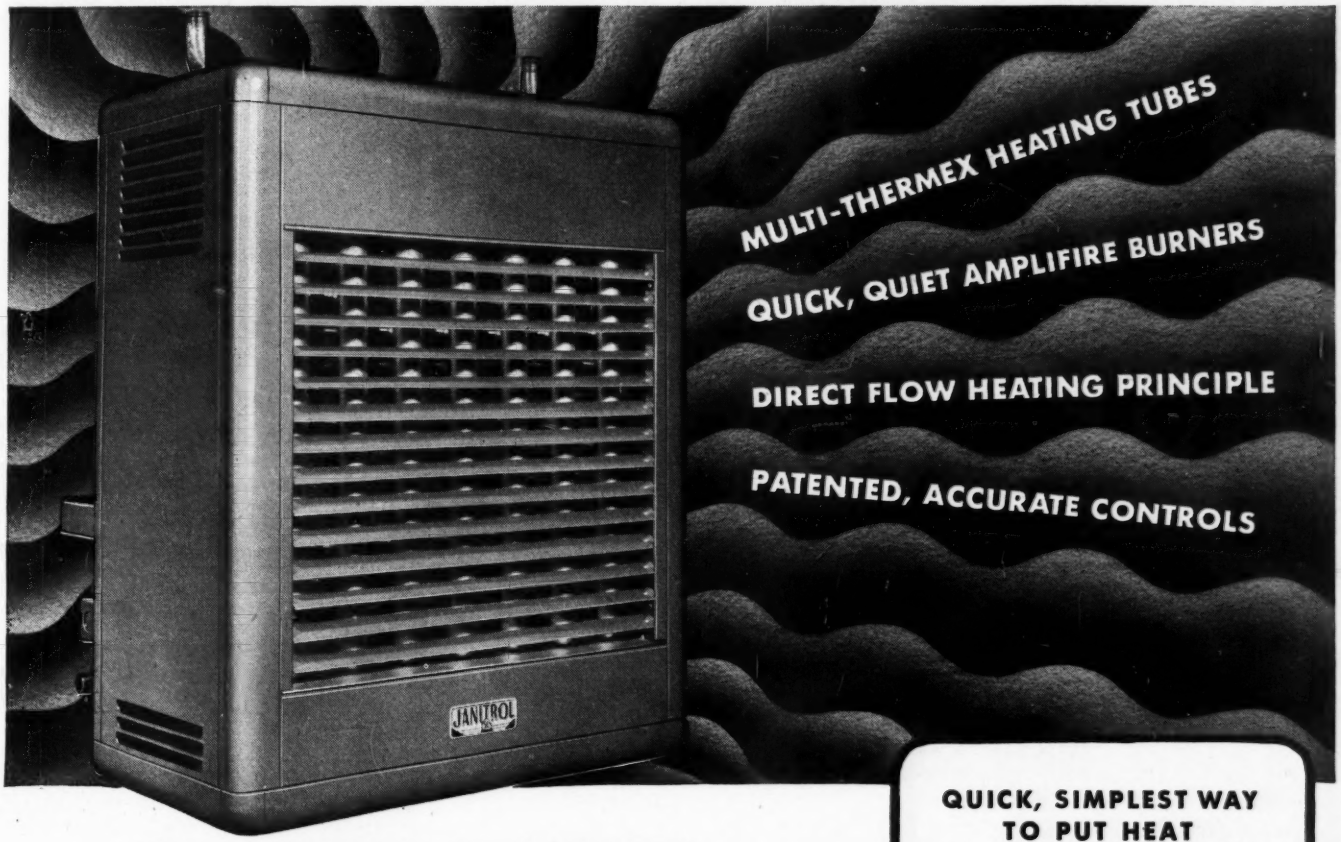
THIS machinery is in use by the San Diego Gas and Electric Co., San Diego, Calif.

Heavy gas pipe may be handled nearly three times as fast as formerly with the aid of a traveling crane which moves about easily and rapidly and is able to handle pipe up to 140 ft. in length.

In addition to eliminating heavy back-breaking work, the Krane Kar does away with the need for blocks, tackle, and jacks. The danger of personal injury is also reduced.

The crane has a 19-ft. boom and is capable of handling up to ten tons of weight. It is used for spotting pipe, lining pipe, raising or lowering pipe into ditches, and in loading and unloading pipe into railway cars and trucks.

INSTALL PROVEN PERFORMANCE



NO OTHER UNIT HEATER COMBINES *ALL* THESE ADVANTAGES

BEFORE the war, gas-fired unit heating was rapidly proving its high efficiency and economy of operation for all kinds of buildings, large and small.

Then, as busy war industries were fast expanding, this method of heating proved most advantageous because of its easy installation and ability to deliver quick, clean heat direct to the places it is needed the most.

New improvement in design and construction, plus several exclusive features, already proven in hundreds of installations, will provide even finer heating performance for those who wisely select Janitrol equipment.

The Janitrol line today represents 35 years of continual research and engineering skill devoted exclusively to the perfection of modern gas heating. Janitrol has always lead the gas heating field, but has never used its customers as "guinea pigs". Janitrol equipment must prove its worth in test installations as well as in our laboratories before it is marketed. That has always been Janitrol's policy and we don't intend to change it.

WRITE TODAY for complete descriptive data and information to

Natural Gas Equipment, Inc.
Pacific Coast Representative
540 Petroleum Bldg., Los Angeles 15
1150 Folsom St., San Francisco 3

QUICK, SIMPLEST WAY TO PUT HEAT WHERE IT IS WANTED

Ranging from 50,000 to 1,250,000 BTU Input

Propeller Fan Type Unit Heater. For retail stores, restaurants and other commercial establishments. Also used widely in industrial plants.

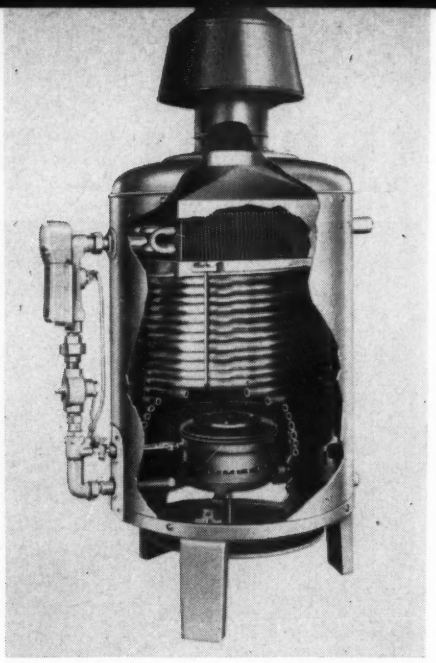
Blower Type Unit Heater. Similar to the propeller fan type but equipped with a powerful centrifugal fan capable of moving larger quantities of warmed air.

Large Floor Type Unit Heater . . . 1,250,000 Btu input, for heating large areas in industrial plants, warehouses, etc. Like other Janitrol models, it may be operated in multiple.

Floor Type Forced Air Heater. Equipped with filters and humidifier. Unusually quiet fan operation makes it an ideal unit for quality stores and other places where it is more practical to install a floor-type unit

JANITROL *GAS-FIRED* FURNACES and HEATING UNITS

Aerial view of the A. O. Smith plant at Kankakee, Ill., taken during construction. The building is 1200 ft. long and 315 ft. wide, and will turn out an expected 250,000 water heaters each year.



This is the heating plant—the SMITHway-Burkay gas water heater, 120 of which will furnish the circulating hot water for the system. A by-pass hookup has been used so that the full capacity of the heater can be utilized.

Huge Radiant System Heats New Smith Plant

WHAT is reputed to be the largest radiant system on record, circulating 15,000 gallons of water 12 times per hour through 40 miles of piping, will heat the Kankakee, Ill., works of the A. O. Smith Corp., new home of the company's gas and electric domestic storage water heaters.

Production in the plant is scheduled to start this month.

One hundred twenty SMITHway-Burkay gas water heaters will furnish heat for the system, which will include wrought iron, copper, and steel pipe. Ninety-six of the heaters are installed in the plant itself, which is divided into 48 bays, each bay being served by two heaters. The bays run across the entire width of the plant—315 feet—and are themselves 25 feet wide.

Considerable experimentation has been allowed in construction. A grid-type floor base is used in 80% of the plant, with a combination grid and continuous coil plan in the remainder. The grids consist of headers and laterals of wrought iron pipe. Varying specifications of laterals and headers were used to give flexibility and to permit experimentation.

Construction of the combined grid and coil layout was dictated by necessity, according to company officials. Pipe suitable for grid type laterals was not available.

By way of further experimentation, a single continuous coil was used in one area. Located near a large furnace in which the heat will exceed 1600° F, the non-heated circulating water in the coil will draw heat from the furnace, and the rate of transfer through the concrete slab between the two may be measured.

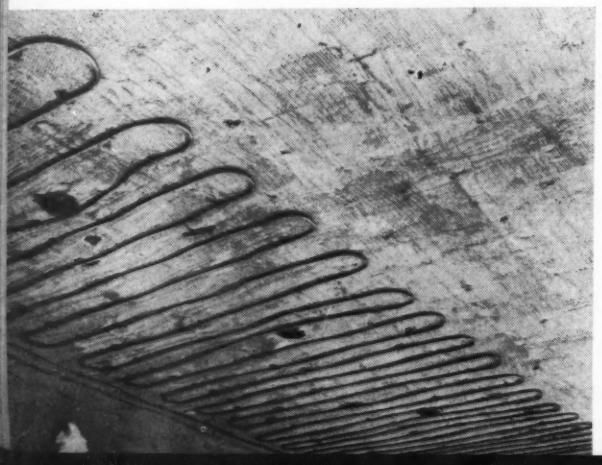
Bundy tubing, the only type available that would fit the reduced thickness of the concrete slab that forms the floor, was used in the grid-type mezzanine installation. The tubing is $\frac{5}{8}$-in. outer diameter, with a .049-in. wall thickness.

For the first floor offices, wrought iron was used in grid-type construction. In the ceiling, an auxiliary wrought iron surface was used at the outside exposures.

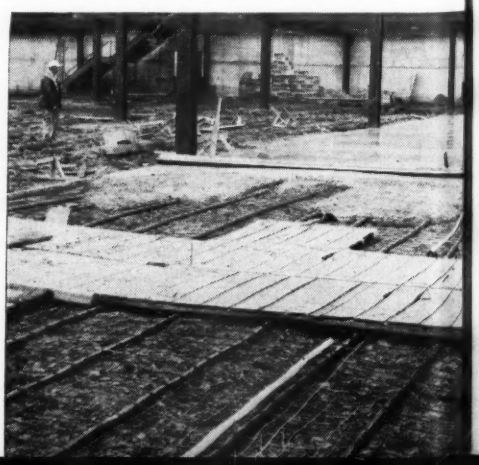
Designer of the system and chief engineer was C. W. Colby.

Copper tubing on the second floor, south office building ceiling, installed on the scratch coat of plaster, over which is laid a $\frac{1}{4}$-in. brown coat and a $\frac{1}{2}$-in. coat of acoustical plaster. The tubes are installed on 4-in. centers at the outside exposure, with center sizes increasing gradually to 10 in. as surface decreases.

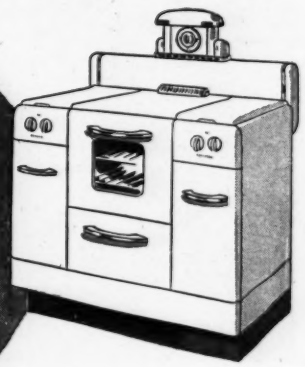
Bundy tubing at the ceiling (embedded in the plaster) as an added concentration of heat at the glass exposure in the entrance lobby, south office building.

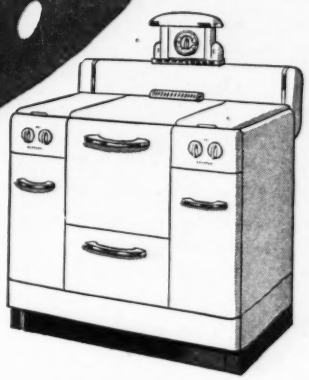


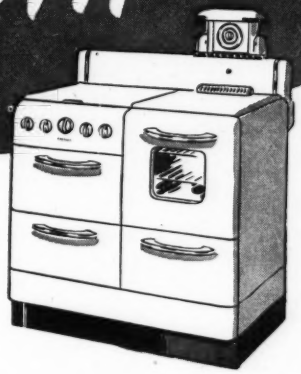
Wrought iron pipe in grids—$1\frac{1}{4}$-in. laterals on 24-in. centers from 2 in. headers—placed directly on the dirt grade with wire mesh and concrete super-imposed.

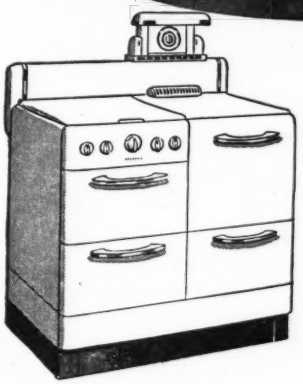


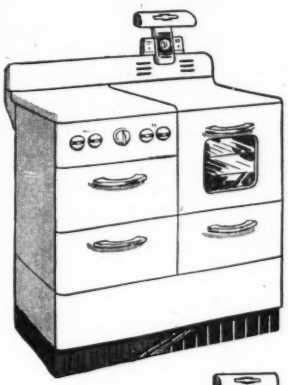
WILL YOU BE READY FOR THE *Buyer's Market?*

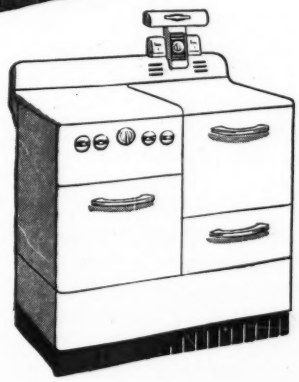












FLORENCE has the broad line of products and "Sales Magnet" features that insure the Soundest Business Future.

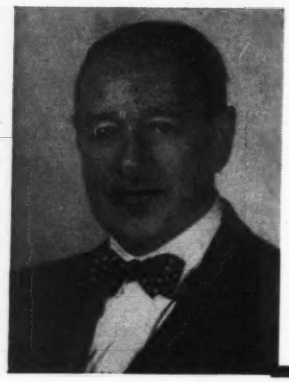
• The signs are many that the present "honeymoon" in many businesses... a market ready to take anything and everything produced... isn't going to last forever.

As Gas Ranges, for example, become more plentiful, customers will grow more critical of styling and features and prices. Once again you'll be moving into a buyer's market—the real test of the line of Gas Ranges you've picked. When it's *Florence*, you're associated with a company that for 74 years has "known how" to build solid, sound business for its dealers everywhere.

With a buyer's market coming up, you'll be ahead with Florence appliances and their "Sales Magnet" features... with Florence advertising support and attractive dealer policies.

FLORENCE
Gas Ranges

FLORENCE STOVE COMPANY... General Sales Offices and Plant: Gardner, Mass. Western Sales Offices and Plant: Kankakee, Ill. Southern Plant: Lewisburg, Tenn. Other Sales Offices: One Park Ave., N. Y.; 1459 Merchandise Mart, Chicago; 53 Alabama St., S. W., Atlanta; 301 No. Market St., Dallas.



PROMOTIONAL NOTES and NOTIONS

By STANLEY JENKS

"Pent-up"

The New Deal economists and their statisticians have been wrong so often that there is little cause to take seriously any figures issued these days by the bureaucrats. In fact, there is ample reason to suspect that the gentle art of rigging statistics for political propaganda purposes is a routine practice.

But where there's smoke, there might be fire, and the conviction is rapidly jelling that even the "pent-up" demand for everything from mouse traps to office safes is considerably phoney.

For example, the accumulated savings in war bonds were supposed to supply the moolah. But, the masses—our real market—own a very small percentage of outstanding government bonds. Apparently, our war workers couldn't stand prosperity. They spent it while the going was good and—well! Washington didn't exactly discourage them from shooting the works, with its paternal solicitude for their future welfare. The Bureau of Agricultural Economics of the U. S. Department of Agriculture recently published a survey made for the Federal Reserve Board of Governors, showing (for what it's worth) that the bottom 40% (the masses) own 1% of the outstanding government securities. Of course, this might have been issued—and probably was—to support a bond savings drive, which in July showed $750,000 sales and cash-ins of the E series bonds of $442,000,000.

Then again, the labor unions are crying for further wage increases, because they claim the present pay lags behind increased prices, and there are no accumulated savings available.

It must be admitted there is no immediate surface evidence of this condition. But if the "pent-up" demand must be paid for out of current earnings and not savings, there's got to be a prompt revision in our long-range planning.

Mental Attitude

It has been said that you are growing old when the cop on his beat looks young to you.

It might just as easily be said that a gas executive is growing too old when he brushes off all convention papers and the printed speeches of sales executives in trade publications as "the same old stuff." Granted, much of it is repetitious—so is your favorite breakfast cereal every morning—but for a very good reason. It is necessary and, shall we say, basically sound advice. On the other hand, the "same old stuff" lad is really doing a bit of bragging. He admits he knows all the answers. And that, brother, covers an awful lot of territory, even if it only covers the service area of the smallest gas company, in a complex, marginal business like the gas industry.

There are certain basic promotional rules as old as the industry itself. For example, we have to establish more than the superiority of our fuel; we have to justify its value. Now "value" is a comparative term, since competition is a definite factor in establishing it. And it is this awareness of competition that makes a good promotional man. Therefore, the "same old stuff" may not be the "same old stuff" after all. It may be either a progress report on the competitive situation or a red light warning that an old competitive threat still exists and urgently needs attention.

Scouting Competition

In exactly the same spirit as a football coach finds it necessary to scout the opposition, the study of as many other fuel trade publications as possible should be a *must* for our own promotional men.

A recent survey shows the domestic oil burner fellows seriously perturbed about the inroads of gas for house heating. A clarion call has been issued for a more intensified sales effort to meet our competition.

The coal stoker lads are riding their John L. Lewis handicap with plans to get a greater share of the business.

Most of us know the ambitions of the kilowatt kids.

The battle of the fuels will be raging sooner than most of us expected. It will be no push-over. And, while we have been fighting it since the Bunsen burner was invented, it has yet to be won. Ever since it started, it has been over the superiority of gas compared with other fuels.

It will continue to be the same old stuff with refinements, and no participant can afford to ignore any ideas or suggestions put forth by the brighter brains of our industry.

Atlantic City

The 28th annual A.G.A. Convention, October 7-11, is the first national postwar parade of the entire industry.

The program, not available at the time of writing, cannot help but be good, especially in the capable hands of Chairman Irving K. Peck and his committee. With a new era on our doorstep, there is so much to be discussed and decided.

The manufacturers' exhibit—Leigh Whitelaw guarantees it to be the largest and finest so far—will be an eye-opener. It will prove again how lucky the gas industry is to have such progressive groups of appliance and accessory manufacturers enlisted for gas service. May the industry frame its promotional plans wisely to keep the gas appliance market profitable for them.

As for Atlantic City itself, it is an experienced host for convention-goers by the thousands. It has its own delectable brand of ozone, recreational facilities for all tastes, and a latitude in conviviality hardly available elsewhere.

Hope to see you there.

Use of Natural Gas Considered for DuPont's Texas Nylon Salt Plant

THAT popular description of nylon's ingredients — coal, air and water—will have to be modified when nylon intermediates made in Texas come into the picture. For natural gas, and petroleum, it is believed, will one day be used at the new $20 million nylon salt plant being constructed by the Du Pont Co. near Orange, Texas.

Nylon salt has nothing to do with ordinary table salt except that both are white and both belong to a very broad class of chemical compounds formed by the reaction of an acid and a base. Whereas table salt is a simple compound which can be prepared from sodium hydroxide and hydrochloric acid, nylon salt is made from two very complex chemicals, adipic acid and hexamethylene diamine.

Texas Plant's Job

The job of the Texas plant will be to produce both of these compounds and then to combine them to form the salt, which will then be shipped to other plants to be converted into yarn, bristles, plastic articles, etc. Currently all the nylon salt is being made at the Du Pont plant at Belle, W. Va.

Hydrogen is needed in the manufacture of both adipic acid and hexamethylene diamine; and natural gas, or methane, is a good source of this element. Methane consists of one atom of carbon and four atoms of hydrogen. The hydrogen will be separated from the carbon at the nylon plant by one or more methods. Natural gas also will be used as a fuel for some of the manufacturing processes.

In making the adipic acid, cyclohexane is used, which is at present made from a coal tar product, benzene, by the addition of six atoms of hydrogen to the benzene molecule. This is one point at which the hydrogen from natural gas will be used in the Texas operations. However, cyclohexane is a naturally occurring component of petroleum, and it is hoped that eventually it will be possible to obtain it directly from this source. It constitutes from less than 1% to more than 4% of the lighter distillate, the so-called naphtha fraction, depending on the source of the crude petroleum, but it must be separated out in relatively pure form for adipic acid manufacture.

Once the adipic acid is manufactured part of it is used in making the other half of the nylon salt combination, hexamethylene diamine. Here ammonia is required, and more hydrogen from natural gas.

New Freedom Gas Kitchen Display Models Available

NOW available to gas companies and dealers is a pint-sized New Freedom Gas Kitchen for show window and showcase display. Measuring only 24 inches overall, it is complete to the smallest detail, with nothing left out but the housewife. Even simulated electrical outlets are included.

The kitchen spotlights the Magic Chef range, the model of which measures but four inches in height. The entire unit, 24 inches long, is 14 inches deep and 12 inches high.

The tiny display was built in four different models by the Schrader Minicraft Co., 420 Penn Ave., Pittsburgh, Pa., for American Stove Co.

Traveling Kitchen Shown by Servel

UNIFIED Gas Kitchen displays, designed by Servel, Inc., probably are the most traveled kitchens in the country today. Since February, Servel's kitchen displays have racked up a total of about 15,000 miles, making the rounds of gas association meetings and home builders' shows.

In June, home economists got a look at the Servel version of the New Freedom Gas Kitchen. One of the newest of the kitchen display units was on view at the American Home Economics Association convention in Cleveland, June 24 to 27.

These units have been prepared by Servel for use on sales floors—part of the company's plan of presenting a complete kitchen for more effective merchandising. According to present plans, gas appliance dealers and gas companies may order display kitchen units from Servel for their own promotions.

R. J. Canniff, Servel's advertising and sales promotion manager, first presented the Unified Gas Kitchen display at the Pennsylvania Gas Association meeting in Philadelphia. Since then, Servel kitchen displays, or components thereof, have been shown in ten cities throughout the country.

After Philadelphia, a kitchen display unit was on view at the National Home Builders Show in Chicago. Galveston, Texas, was the next stop, and here members of the Southern Gas Association got a look at it.

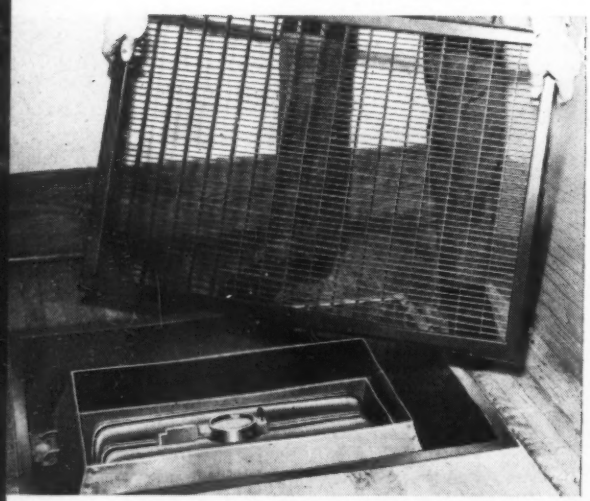
Other units of Servel's "traveling" kitchens were attracting the interest of home builders at shows in Milwaukee and Minneapolis at about the same time. The Detroit Home Builders Show was the next stop on the itinerary.

The kitchen displays were on view in May in Indianapolis, Ind., at a home builders' show, and at the Florida-Georgia Gas Meter Association meeting in Savannah, Ga. The last week in May, the Unified Gas Kitchen was set up at a home appliance show in Evansville, Ind. Servel also had on display at that show its other gas appliances, the water heater and all-year air conditioning unit.

Miss Clara Ridder, Servel home economics director, demonstrates to a visitor the air control unit in Servel's "traveling kitchen," at the Cleveland meeting of the American Home Economics Association. The unit serves to carry off cooking vapors.

Sales Pointers . . . on New GAS Appliances

Area heating is provided by an installation such as the one shown above. No basement is needed.



Tremendous warm air flow is provided by the 78°o open register.

Coleman Gas Furnace

Manufacturer: The Coleman Company, Inc., Wichita 1, Kansas.

This unit type of heating is rapidly gaining in popularity in every section of the United States, because of its dependable and satisfactory performance. It is a complete, compact individual heating unit that comes ready to install. After it is set in the floor at the selected spot, all that is then necessary is to make vent pipe connections and hook onto the gas main.

It has widespread use and it is particularly adapted to small homes of the one-story type and is extensively used in mass housing projects. It is also used in business buildings such as stores, tourist courts, schools, churches, offices and shops.

Here are some the more important points of the Coleman gas floor furnace which have particular appeal:

1. *It is Automatic.* That means it is work free: no chopping of kindling, carrying fuel, shoveling ashes. One match is all the kindling that is needed. Light the furnace in the fall, set the thermostat for the desired temperature and it runs itself—no bother, no worry, no further attention is necessary.

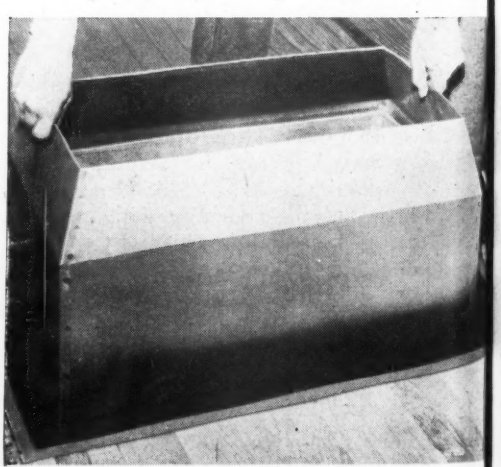
2. It is *clean heat.* There is no dust, no muss, no gritty fuel dirt, no ashes to litter floors and wear out rugs; no soot to cause frequent cleaning of walls, ceilings, and curtains. There is less laundry, no endless hours of house cleaning.

3. *It MOVES the heat.* This is the secret of the remarkable Coleman "Warm Floors" comfort. This furnace continuously draws the cool air off the floor and circulates it through the heating chamber of the furnace, where the air is thoroughly warmed, heat-sterilized, and circulated to the far walls and corners of the rooms. There are no stagnant dead air pockets, no cold corners, no overheated ceilings, no cold floors. The air is kept freshly heated and in constant circulation for healthful comfort.

4. *Adaptable to any need.* There are seven models of Coleman gas floor furnaces ranging in heat input from 25,000 to 70,000 Btu's per hour, with a heating efficiency actually greater than that prescribed by the American Gas Association. There are flat register models for locating in single rooms or between two rooms, as well as dual-wall models which are placed under the wall for heating two separate rooms.

5. They provide *area heating.* With this type of furnace it is possible to have multiple installations of two or more furnaces. Since each furnace operates individually, it is possible with multiple installations to have area or zone heating at the desired temperature or at different temperatures in different areas of the home at the same time. Frequently multiple installations will do a better and more satisfactory job of heating at less cost than a single central heating plant.

6. *Other features* which are of particular interest and aid in the fine heating performance of the furnace include the streamlined bottom which speeds up the warm flow; moveable inner walls which permit easy cleaning of the inside of the furnace; easy, quick installation



Removable inner walls make cleaning quick and easy.

WEDGEWOOD...

First in the West

Today — more than ever before — Wedgewood Gas ranges are the first choice of Western home-makers. In Quality, Beauty, and Performance, Wedgewood has always been the pioneer, and no effort will be spared in the future to maintain the leadership won over a period of 64 years. James Graham engineers and designers intend to keep Wedgewood "First in the West."

MODERNS PREFER GAS

FOR ALL GASES, INCLUDING LP (LIQUEFIED PETROLEUM) GAS

WEDGEWOOD LEADER IN THE WEST

JAMES GRAHAM MFG. CO.

LOS ANGELES • GENERAL OFFICES & FACTORY, NEWARK, CALIF. • SAN FRANCISCO

TECHNICAL TRENDS

By GUY CORFIELD, Technical Editor

Winning the Battle of Corrosion

Corrosion (of metals) has been, and still is, considered by many persons in the same category as the weather: something about which everybody talks but nobody does anything. While this thought, or accusation, may have been largely justified a number of years ago, it is no longer true nor applicable to the large number of corrosion engineers who are now serving industry. These corrosion engineers, who are now being recognized by title as well as by accomplishment, have in a large measure, by fundamental and applied research, application, collaboration, and cooperation, developed many basic and practical criteria. The capabilities and limitations of most metals and alloys and protective coatings are well explored so that many structures can be operated with little if any serious corrosion and, if conditions are so severe that corrosion must be accepted, it can usually be predicted with reasonable certainty and due allowance can be made.

Many individuals and groups have worked diligently to combat the corrosive deterioration of metals, and an organization has recently been formed—the National Association of Corrosion Engineers—devoted exclusively to the problem of corrosion in all its phases. This organization has already advanced to the status where it held, last May in Kansas City, a full-fledged three-day convention and exhibit with attendance of some 500 individuals including the nation's foremost authorities.

Symposia were held there representing the water, electrical and communication, chemical, gas, oil, and general industries, at which 33 papers were presented and discussed. These papers will appear in forthcoming issues of the association's official monthly publication, "Corrosion." A feature of the program was an afternoon devoted to corrosion activities of other technical societies during which representatives of 14 such societies, headed by the American Coordinating Committee on Corrosion, gave a brief resume of the manner in which these societies handle corrosion problems. The spirit of cooperation evidenced throughout the meetings made it evident that increasing strides in corrosion control can be expected.

A Definition of Research

There have been many definitions written for "research" both general and specialized. Webster states that it is "careful or critical examination in seeking facts or principles." Maurice Nelles of Lockheed Corp. defines engineering research as "a process of solving difficult technical problems." Perhaps the best and most simple general definition yet stated is that research is *an orderly search for facts.*

It would seem that the word to be stressed, and the goal of all research, is *facts,* for it is only with facts available that correct decisions can be made and effective actions taken. Great care must be exercised that the research findings are "true facts" as misinformation is worse than no information. As it has been so aptly stated: it is not the things we don't know that should worry us, but rather the things we think we know, which are not true.

In one sense this should make the technical research worker's job relatively circumscribed. He can devote his energies to development of technical facts, based on correct measurement and trained observation, and to the recording and presenting of them in an orderly and understandable manner. He does not have to cope with opinions, policies, politics, legal restraints and other more general and intangible considerations.

Location of Forced Warm Air Registers

The article elsewhere in this issue, by the Payne Furnace Co., on the location of forced warm air heating registers, discusses a topic on which there are as many asserted opinions as there are methods. Some heating engineers advocate high registers and some low, and most locate these registers on inside walls presumably because they are nearer to the furnace and therefore require less duct distance. The argument is further complicated when it is assertedly desired to accomplish both winter heating and summer cooling through the same ducts and registers, the evidence presumably favoring the high register advocates because it is generally acknowledged that cooling air should be introduced at or near the ceiling.

Payne Furnace rather boldly advocates low registers on outside walls, and preferably under windows, backed by the seemingly reasonable argument that the outside walls in general and windows in particular are the coldest areas in the room—where the infiltering cold air enters and the heat escapes—and therefore the logical areas for application of heat. It can be argued that such locations involve greater expense because longer duct runs are generally necessary, not only costing more to install than shorter ones but also causing some additional heat loss from the ducts in basementless or one-story homes. However, this does not seem to have deterred the hot water and steam heat engineers, who have always installed their radiators under windows.

Payne Furnace Co.'s answer to those who desire to use the outlets for the dual purpose of heating and cooling is simply that the two jobs cannot both be done efficiently through the same air outlets, and since heating is a greater and longer seasonal requirement than cooling and, at least at present and in the near future relatively little residential cooling is or probably will be installed, the soundest engineering should be applied to the heating job.

NEW PRODUCTS

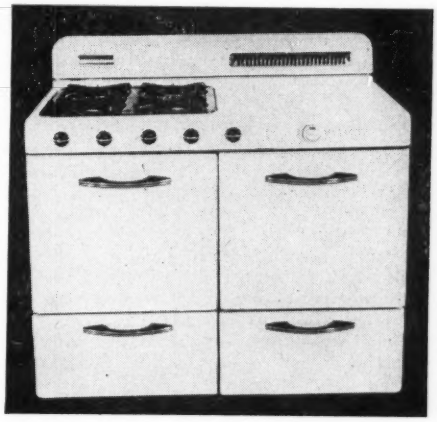
Crosley Gas Range

The Crosley Corp., Manufacturing Div., Cincinnati 25, Ohio.

Model: SGN-17—Standard Gas Range.

Application: For all domestic cooking.

Description: "The c-wrapper," Crosley's patented name for the entirely new one-piece structural core which supports the top and contains the ovens and drawers and to which the front and sides of the range are attached, is the outstanding feature of this new range. It is incorporated in the design to add years of life and structural strength to the range.



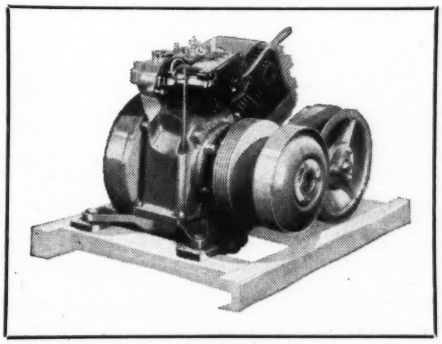
The gracefully receding front slopes gently from the bottom drawer to the floor, providing toe space. The oven is extra roomy, measuring 15 3/8 in. high, 17¼ in. wide, and 19 in. deep. The waist high broiler moves out as the oven door is opened. Other features include three 900 and one giant 12,000-Btu top burner; oven burner service door, which provides access to oven burner, and flat ribbon type broiler pan insert.

Automatic Driving Unit

Salsbury Motors, Inc., 4464 District Blvd., Los Angeles, Calif.

Model: Salsbury Power Package.

Application: According to manufacturers, this 6 hp Power Package possesses unusual advantages where, in the power range, high starting torques or momentary underloading or overloading occur. It is adaptable to a variety of needs in the stationary, portable or vehicular fields.



Description: Drive ratios in this unit are controlled by the driven unit, and clutch engagement is controlled by engine speed. In the automatic transmission a variable diameter drive pulley, a variable diameter driven pulley, and a V-belt form a coordinated assembly which gives automatic, variable ratios over a 4 to 1 range. Drive ratio in this torque converter is controlled as a function of driven shaft speed. Normal life of the V-belt used is about 1000 to 3000 hours, depending upon care and type of service.

The automatic, centrifugally-operated Salsbury clutch is built into the drive pulley of the Power Package. The engine, Salsbury Model 600, is a single-cylinder, four-cycle, air-cooled type, developing 6.5 hp at 3200 rpm. It occupies 1⅛ cu. ft. and weighs 56 lb.

Flareless Fitting

Parker Appliance Co., Cleveland, Ohio.

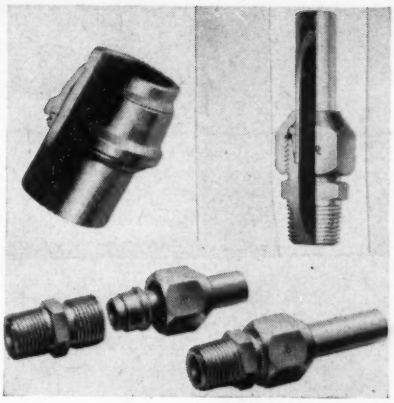
Model: Ferulok Tube Coupling.

Application: For joining all types of metal tubing, including ¼-in. hard stainless steel, in hydraulic and fluid-conveying systems.

Description: This fitting, which eliminates the need for special flaring and assembly tools, brazing or soldering, employs a steel ferrule which, when body and enclosing nut are tightened, cuts a shoulder in the tubing itself, providing a strong, tight sealing grasp for the assembly. It is particularly useful in high pressure applications and where thick wall tubing is used.

Joints on which the new ftting is used may be broken at any time without affecting resealability. This also permits the disassembly of any joint before final assembly for visual inspection of the quality of the gripping cut.

Initially, the product is available in ¼-in. and 1-in. O.D. tube sizes, in all conventional shapes and materials.

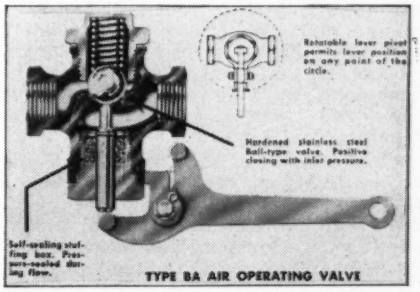


Air Operating Valve

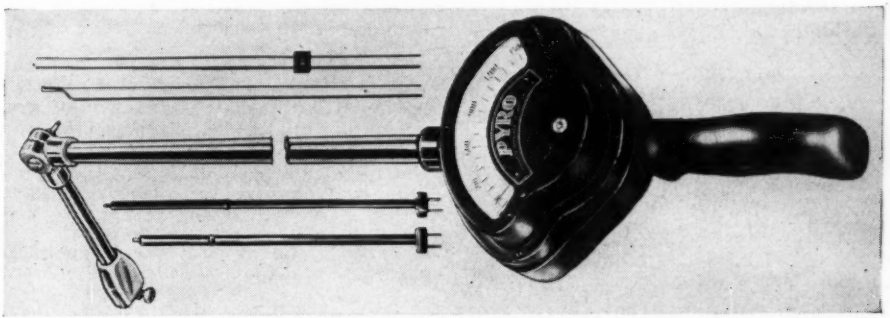
Leslie Co., 92 Delafield Ave., Lyndhurst, N. J.

Model: Self-sealing, air operating, ball type valve, type BA.

Application: Where operation from various positions is required. Hand opening lever can be located in any position and the valve can be opened instantly from almost any position with either a horizontal or vertical pull.


Rotatable lever pivot permits lever position on any point of the circle.
Hardened stainless steel Ball-type valve. Positive closing with inlet pressure.
Self-sealing stuffing box. Pressure-sealed during flow.
TYPE BA AIR OPERATING VALVE

Description: Stuffing box is not accessible to tampering or adjustment and is self-packed by the operating pressure (up to 200 psi recommended) when the valve is open, permitting flow.



Immersion Pyrometer

Pyrometer Instrument Co., 103 Lafayette St., New York 13, N.Y.

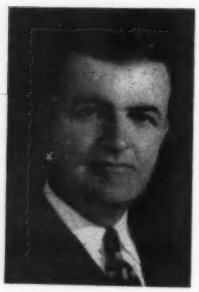
Model: Immersion Pyrometer.

Application: Especially designed for the non-ferrous industry. Combines ruggedness, dependability, accuracy and ease of operation.

Description: An indicator with 4-in. direct reading scale calibrated from 0-1500° F. or 0-2500° F. or equivalent Centigrade. Two models are manufactured with overall lengths of 27 in. and 43 in., both with a special swivel 8 in. from the connector block, permitting use of the pyrometer at any angle. The instrument may be used with bare metal and with protected type thermocouples, both being instantly interchangeable.

This thermo-electric system is constructed with a permanent magnet and is housed in a shock, moisture and dust-proofed steel case. Write the company for catalog No. 150.

PEOPLE



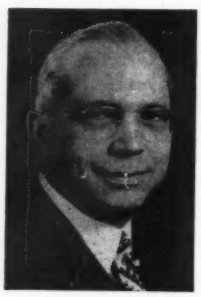
R. W. Stafford

• It was recently announced that **R. W. Stafford,** formerly chief engineer of Connelly Iron Sponge & Governor Co., has resigned to organize The R. W. Stafford Co., which will engage in engineering and construction work in the gas industry. Stafford was associated with Connelly for more than eight years. He is also vice president and director of The Stafford Co. of Colorado, Reba Sherman Building Corp., Dr. Pierre Chemical Co., and Partola Products Co. of Chicago. The new company has offices at 162 N. Franklin St., Chicago.

• **Raymond H. Van Saun** has been appointed manager of the new Mexico City plant of Rheem de Mexico S.A. The factory will produce steel shipping containers and inexpensive water heaters and space heaters. Prior to joining Rheem as assistant manager of the Richmond, Calif., plant, Van Saun was associated with Container Corp. of America for ten years.

• **Carl B. Myers,** controller, and **Ronald L. McVey,** assistant to the vice president, both of Tennessee Gas and Transmission Co., Houston, have been elected to membership in the Controllers Institute of America. The institute is an organization of controllers devoted to improvement of controllership procedure.

• **H. Edwin Olson** and **George S. Young,** directors of The Manufacturers Light & Heat Co., have been elected to the board of directors of Columbia Gas & Electric Corp. Olson is financial vice president of Columbia, and Young is vice president of Columbia Engineering Corp., a subsidiary.



Gordon Rieley

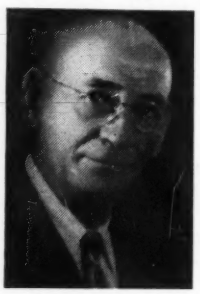
• **Gordon Rieley,** vice president of Bryant Heater Co., Cleveland, has been appointed general manager of the new Bryant plant now being completed in Tyler, Texas, according to an announcement by **Lyle C. Harvey,** president. Rieley, who has been on leave while serving with the OPA, has been associated with Bryant for the past 12 years in specialized market research and sales and production. He took over his new duties on July 25.

• **H. R. Austin,** president of the M. W. Kellogg Co., recently announced that **E. F. Liebrecht,** who has been general patent attorney for Kellogg since 1940, has been elected a vice president of the company. Liebrecht has college degrees in both engineering and law and is an exponent of the open license system, which makes new developments available to the entire industry.

• **W. F. Wright,** general manager of Lone Star Gas Co.'s Dallas division has announced the appointment of **William P. Stone** as the division's industrial engineer. Stone succeeds **L. G. Waskon.**

Frank Pope has been transferred from Lone Star's Dallas division to the division managership of the office at Vernon, Texas.

• **Henry Moecker, Jr.,** manager of American Stove Co.'s Cleveland manufacturing division has announced his retirement effective Aug. 1, bringing to an end a half-century of uninterrupted service. Moecker began with the company at Harvey, Ill., as a bench and machine worker in 1896. He has been manager of the Cleveland plant since 1934



A. W. Leeseberg

H. Moecker, Jr.

and has been a member of the company's board of directors for many years.

A. W. Leeseberg, formerly the production coordinator of the Cleveland division, has been appointed manager of the division, succeeding Moecker. Leesberg's story is that of office boy to manager in 40 years of service.

• The Tampa (Fla.) Gas Co. has announced the appointment of **Frederick A. Scheffler** as sales manager of gas usage and appliances. For the last four years, Scheffler has been connected with the Anaconda Copper Mining Co., traveling the country to supervise installation of ore processing plants.

• **Paul E. Coxey** has been appointed regional manager for Maytag Dutch Oven gas ranges, in addition to other appliances manufactured by the company. His sales territory will include the counties of Westmoreland, Indiana, Armstrong, Cambria and Somerset, Pa. Coxey has been with the Maytag Co. for 20 years.

• **William F. McConner,** general manager of sales of National Tube Co. since 1936, has been named vice president in charge of sales of this United States Steel Corp. pipe manufacturing subsidiary. McConner succeeds **John E. Goble,** who has just been elected president of the company.

• **W. C. Beckjord,** president of the Cincinnati Gas & Electric Co. has announced the creation of two new divisions in the Industrial Relations Department, and the appointment of **William Wass** and **Joseph E. Bell** to head them. The new units are the Division of Employment, under the direction of Bell as employment manager, and Employees' Activities Division, under Wass as coordinator of employee activities. Wass has been associated with the company for more than 27 years in various capacities. Bell has been an employee of the company since 1928 and is a graduate electrical engineer.

• **Miss Alice M. Janota** has joined the Publicity Bureau of the American Gas Association as an assistant director in charge of domestic gas publicity, covering the domestic use of gas in homes for national magazines, women's pages of newspapers, and women's programs in radio. She was formerly assistant to the dietitian of the navy cafeteria in Washington, D. C., and editorial assistant of Food Industries Magazine, and is a graduate of Pennsylvania State College.

• **William G. Hirschfeld** has been appointed products sales engineer according to an announcement by **C. H. Gueffroy,** vice president, Portland Gas & Coke Co. Hirschfeld spent 14 years in the New York office of Reilly Tar & Chemical Corp. For Portland Gas & Coke he will market tar products, naphthalene and light oils.

• **J. Reed Hartman,** manager of the electric sales department, Cincinnati Gas & Electric Co., and **Edwin R. Rothert,** manager of the gas commercial department, have been made vice presidents of the company. Hartman joined CG&E in 1923 as research engineer and Rothert started as a timekeeper in 1910.

D. J. Atwell

• The appointment of **Daniel J. Atwell** as New England district manager for the sale of Dresser products to the gas industry has been announced by **H. Z. Hight,** Sales Manager of Dresser Manufacturing Division, Dresser Industries, Inc., Bradford, Pa. Atwell has been associated with the company for some months, both at the factory and in the field on special assignments. He will cover New Jersey and all of the New England States.

• **O. W. Brewer,** secretary of the American Gas Association, New York, has been appointed chairman of the finance committee of the forthcoming 15th annual meeting of the Controllers Institute of America, to be held in the Hotel Commodore, New York, September 15 to 18.

• **William D. Mastin** has returned to Robertshaw Thermostat Co. as southern representative. Mastin served with the air corps since 1941, spending 28 months in the CBI theater.

"HARDWICK" MEANS GOOD GAS RANGES

HARDWICK GAS RANGES ARE

TOPS IN COOKING PERFORMANCE

HARDWICK GAS RANGES ARE BUILT OF FINEST MATERIALS,
BUILT BY SKILLED CRAFTSMEN,

BUILT TO ENDURE

HARDWICK GAS RANGES ARE

PRICED TO SUIT 8 OUT OF 10

TOO EXPENSIVE FOR ONE

JUST RIGHT FOR EIGHT

NOT ENOUGH GADGETS, NOT EXPENSIVE ENOUGH FOR ONE

YOU CAN INCREASE YOUR VOLUME, WIN NEW CUSTOMERS, MAKE MORE MONEY BY FEATURING

HARDWICK Gas RANGES

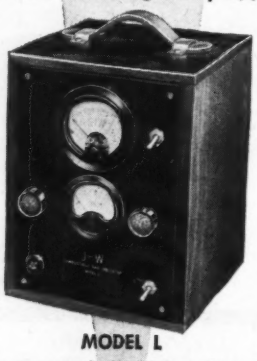
HARDWICK STOVE COMPANY
CLEVELAND, TENNESSEE
The Quality Line Since '79

Detect
COMBUSTIBLE
GASES
QUICKLY
ACCURATELY

McDonald
J-W Combustible
Gas INDICATORS

MODEL F

A simple, portable instrument that reads directly in terms of "Explosibility" of the gas being tested. Flame arresting system prevents flash-backs. All gases are measured on one scale in units common to all. Weighs only 6¼ lbs.



MODEL L

Electrically operated for laboratory testing — portable to any spot where 110-volt A.C. current is available. Highly versatile for testing field samples, liquid fuels, analytical work.

WRITE FOR BULLETINS

B. F. McDONALD CO.

Manufacturers & Distributors of Industrial Safety Equipment

Safety FROM HEAD TO FOOT

5100-G SOUTH HOOVER STREET
LOS ANGELES 37, CALIFORNIA
Other Offices in
San Francisco and Houston

R. R. Newquist

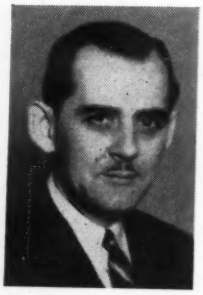
• **Ralph R. Newquist** has been elected vice president in charge of sales of Roots-Connersville Blower Corp., Connersville, Ind., one of the Dresser Industries. A native of Youngwood, Pa., and a graduate of Pennsylvania State College, Newquist has been successively employed by the Reliance Electric & Engineering Co., the Louis Allis Co., and Allis-Chalmers Mfg. Co. He is a member of AIEE, the Society of Naval Engineers, and the American Society of Naval Architecture and Marine Engineering.

• **T. B. Burris** has been appointed assistant sales manager, Process Controls Division of the Fisher Governor Co. He will devote most of his time and effort to business dealing with process industries. Burris joined the Fisher sales engineering staff in August, 1941, and since then he has spent considerable time in the field. He was instrumentation engineering consultant for the Oak Ridge bomb plant, and earlier this year he went to England for the purpose of surveying the sale and marketing possibilities of Fisher control equipment there and on the continent.

• **V. E. Middlebrook** has been named manager of the new gas-gasoline division of Shell Oil Co., Inc., which was set up as a separate department on July 1. Middlebrook has been employed in the natural gasoline industry since he graduated from Texas A. & M. College in June 1928. Prior to joining Shell in 1937, he had been employed by Coltexo, The Texas Empire Pipe Line Co. and Phillips Petroleum Co.

• **Gordon D. Boyle,** sales representative for the Tappan Stove Co., Mansfield, Ohio, has been named a district manager for the firm, according to an announcement by **A. B. Ritzenthaler,** vice president in charge of sales. Boyle, who has been with Tappan since 1935, will be in charge of Kentucky, Tennessee, and Southern West Virginia.

• **Frank W. Smith,** 79, president of Consolidated Edison Co., of New York, Inc., until his retirement in 1937, died on July 22 following a lingering illness. When he retired in 1937, Smith had been active in the electric industry for 57 years.



C. F. Breitenbach

• **A. W. Conley,** executive vice president of the Coroaire Heater Corp., Cleveland, Ohio, and its subsidiary, Hot Boy, Inc., has announced the appointment of **C. F. Breitenbach** as manager of Hot Boy. Breitenbach was formerly assistant to the executive vice president, and for many years before that was an executive with the May Co. of Cleveland.

• **Warren Stuckey** has been appointed chief engineer of the Moore Corporation, Joliet, Ill., according to Bernard J. Hank, president. Stuckey was chief testing engineer of the Florence Stove Co., Kankakee, Ill., for ten years, and during the war was chief inspector and metallurgist in the Florence armor plate program for Standard Steel Spring, Pressed Steel Car, Cadillac, Fisher Body and International Harvester. At the completion of the armor plate production he went to the National Enameling and Stamping Co., Milwaukee, as mechanical and combustion engineer, developing a new line of oil ranges.

• **A. J. Goss,** formerly vice president and general manager of the Chattanooga Gas Co., has been elected president of the company, succeeding **C. van der Berg,** who was elected chairman of the board. At the same time, **H. R. Derrick** of Birmingham became vice president of operations to succeed Goss.

Food Preservation Program Aided by Houston Natural

The Houston Natural Gas Corp. is aiding the long-range food preservation program in three ways, according to company officials. First, the company is continuing to lend, without charge, pressure cookers to homemakers for use in canning vegetables, fruits, meats and other food products. The program was inaugurated in 1943 as a wartime measure, and since then 3807 Texas homemakers have borrowed the cookers to can more than 85,000 quarts of food. Since last May, 4717 quarts have been processed by 176 homemakers.

Second, the company is publicizing the food preservation campaign through the erection of four displays in its Houston office sales windows. Third, through its home service department, it has published and distributed numerous bulletins on gardening, prevention of spoilage, and rules for canning and freezing various food products.

FPC Rate Reduction Order Upheld by Circuit Court

An order reducing the wholesale rates on natural gas produced in Louisiana was upheld at New Orleans, August 3, by the United States Fifth Circuit Court of Appeals. The court denied a petition of the Interstate Natural Gas Co., Inc., to "review and set aside" a Federal Power Commission order filed April 27, 1945. The FPC order declared prices charged by Interstate to Southern Natural Gas Co., Memphis Natural Gas Co., and the Mississippi River Fuel Corp. were "unjust and unreasonable." It set 4.66 cents per cu. ft. at the maximum rate.

Southern Gas & Equipment Opens Jacksonville Plant

Southern Gas and Equipment Co., with headquarters in Tulsa, has opened a plant in Jacksonville, Fla., with C. C. Skinner as manager. The Florida plant has a contract with the Merrill-Stevens Co. to build liquefied petroleum gas containers. It is predicted that the new industry may expand into mass production within the next few months.

BRADFORD

WATER HEATERS ARE EQUIPPED WITH DOMESTIC CONTROLS...

Domestic Model HT-1 LS supplied to Pennsylvania Range Boiler Company, Philadelphia.

Many leading water heater manufacturers rely on Domestic Thermostats and Pilots to assure the safe, efficient performance of their heaters.

Domestic Thermostat Company

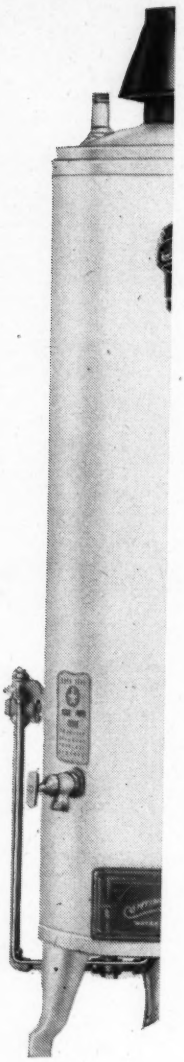
156 WEST PICO BOULEVARD, LOS ANGELES 15

Domestic

WATER HEATER THERMOSTATS AND AUTOMATIC PILOTS

WE SELL ONLY TO MANUFACTURERS OF A.G.A. APPROVED WATER HEATERS

SILENT PARTNER



The owner of a home equipped with a CONTINENTAL BLUE FLAME water heater *knows* there will be a constant supply of hot water. He *knows* safety devices will cut off the gas if the pilot light blows out, and that long wearing parts and careful construction will cut maintenance costs.

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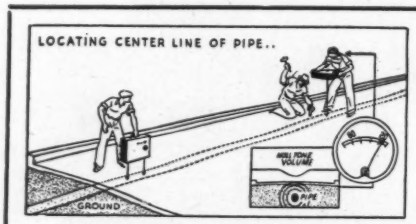

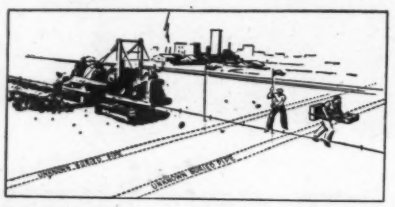

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PIPE LINE NEWS

• **The Sullivan-Ross Co.**, a Texas contracting firm, has been awarded a contract for the construction of about 71 miles of pipe line in Alabama. The towns of Foley and Fairhope, Ala., signed the contract with Sullivan-Ross. Robertsdale has granted a franchise to Foley to supply natural gas and other towns are expected to follow. Bay Minette, Ala., has authorized a bond issue to finance an 8-mile extension to municipal lines.

• **Southern Natural Gas Co.**, Birmingham, Ala., has been authorized to install meters and pressure regulating equipment and to build about 87 miles of pipe line. Connecting lines will be built by the cities of Ragland, Ala., and Sylacauga, Ala.; **Alabama Gas Co., Alabama Natural Gas Corp., Birmingham Gas Co.** and **Atlanta Gas Light Co.**, resulting in the distribution of natural gas in 12 communities which are without it at present.

• An 18-mile pipe line which is to carry a supply of gas from **Tennessee Gas & Transmission Co.** lines will be built by **Kentucky Natural Gas Corp.**, Owensboro, Ky., from Russellville, Ky., to near Mitchellville, Tenn. The new facilities, which Kentucky Natural states are necessary to insure adequate service to present customers will cost approximately $213,840.

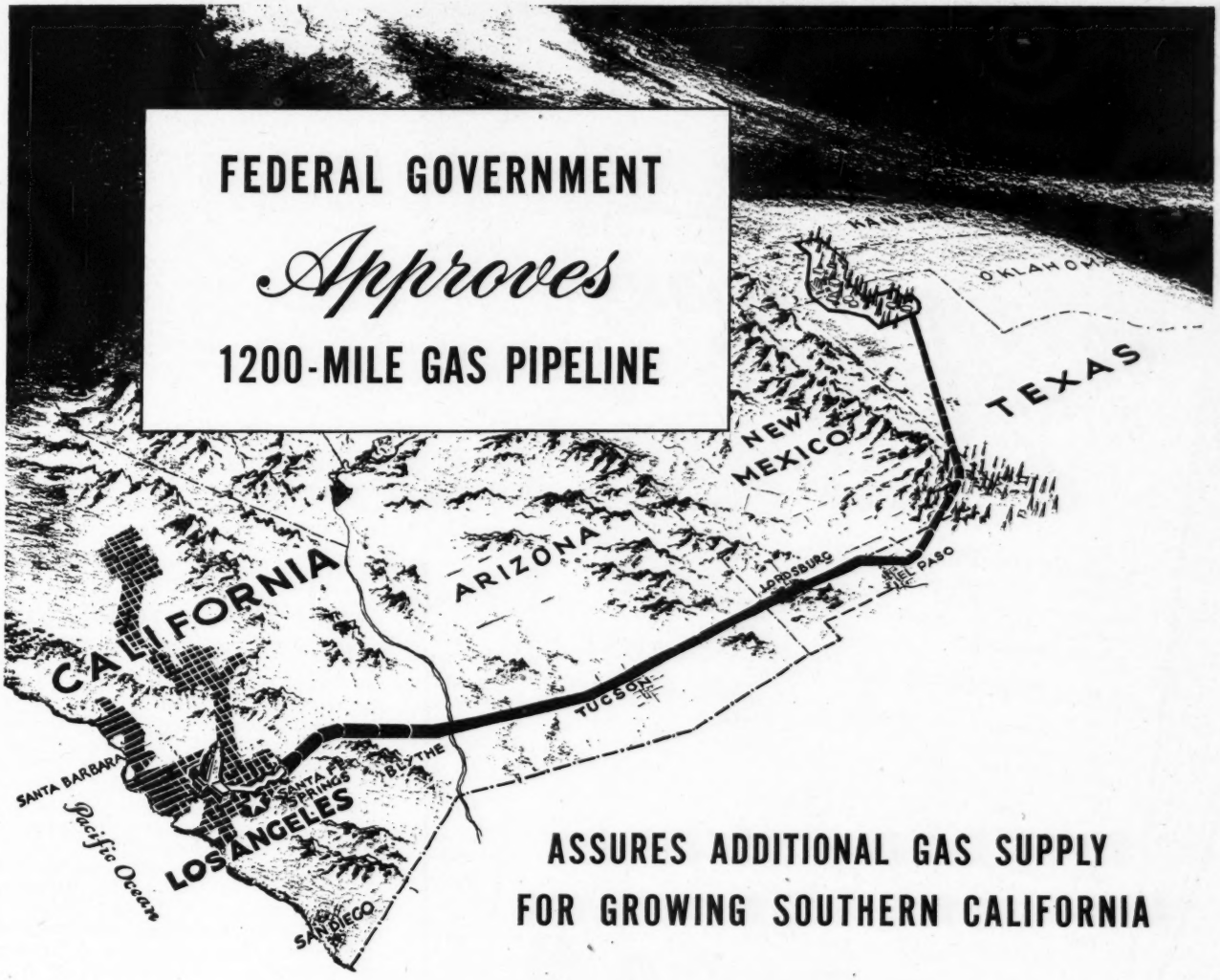
• **United Gas Pipe Line Co.**, Shreveport, has been granted FPC authorization to construct additions in Mississippi and Louisiana to its main pipe line system. New construction and necessary field facilities will cost about $2.3 million. New extensions will connect the company's main lines with the Baxterville and Gwinville fields in Mississippi and the Hayes field in Louisiana.

• The **Union Gas Co.** of Canada, operating in southwestern Ontario, ran into difficulties recently because of a strike in Canada's basic steel industry. An official of the company at Sarnia, Ontario, revealed Aug. 8 that the company had been unable to obtain delivery of pipe necessary in the construction of a pipe line to bring in gas from Texas fields.

• The FPC has authorized a 70-mile, 14-in. pipe line to be constructed by **Cincinnati Gas Transportation Co.**, Charleston, W. Va., from near Foster, Ky., to Means, Ky. Cost of the line, which is expected to be completed by Nov. 1, is estimated at $1.8 million.

• **The East Ohio Gas Co.**, Cleveland, Ohio, has been authorized by FPC to construct and operate a 144-mile pipe line from Hope Natural Gas Co.'s outlet at the Ohio-West Virginia state line to the outskirts of Cleveland. Estimated cost is about $4.6 million.

• **Hope Natural Gas Co.**, Clarksburg, W. Va., has been authorized by FPC to construct and operate a 3000-hp compressor station and about 143 miles of pipe line in West Virginia. Estimated total cost of the new facilities is $5,327,500.



ASSURES ADDITIONAL GAS SUPPLY FOR GROWING SOUTHERN CALIFORNIA

On May 31, the Federal Power Commission approved construction of a Texas-California pipeline project to be completed at a cost of more than $70,000,000. Based on applications of Southern California and Southern Counties Gas Companies and El Paso Natural Gas Company, the project is to augment California's natural gas supply from the extensive reserves in Texas and New Mexico. To be completed for the Winter of 1947-48.

★ ★ ★

You and your 3,500,000 neighbors enjoy living standards set by Southern California's fabulous Horn of Plenty... a wealth of natural resources, a climate that is unsurpassed, a fuller, better way of life.

But as we grow, *the demands on our resources are increasing steadily;* and maintaining these standards is a challenge...

Future Supply

The continuance of a plentiful supply of natural gas, for example, is vital for our millions of homes and future development. The energy that natural gas *already* delivers to Southern California is tremendous; and our postwar building program has yet to start!

Southern California has met the challenge of the future with vision and daring enterprise:

Construction of a spectacular 1200-mile pipeline to transport a continuing supply of natural gas from the Mid-Continent Fields in Texas has now been fully approved by the California Railroad Commission and the Federal Power Commission. California gas companies will construct the portion of the line from the California border westwards, and the El Paso Natural Gas Company, which will supply the gas, will build the balance of the line.

Southern California is indeed fortunate in being able to tap the abundant reserves of the Mid-Continent Fields. The new project will put to use a large volume of gas now being wasted for lack of a market... and still greater reserves are available for future needs!

Big Project

This 1200-mile pipeline, crossing the Continental Divide, is to be one of Southern California's great engineering undertakings. It is the largest, long-distance gas transmission line ever built, with a pipeline measuring up to 30 inches in diameter!

The natural gas it is to transport would care for every home in the four metropolitan cities of Akron, San Antonio, Des Moines and Indianapolis combined. At its ultimate capacity, it will deliver the equivalent energy *daily* of 47,000 barrels of oil... or 189 carloads of coal... or *three times* the electrical energy produced by Boulder Dam.

Work Started

Preliminary work is under way: orders for the 258,000 tons of pipe have been placed; a survey of the 1200-mile route has nearly been completed.

Actual construction will provide more than 4,000,000 man-hours of work. It starts early this Fall and will be ready for the Winter of 1947-48.

The approval of this project, so vital to Southern California's future development, is a gratification we believe every home owner can share.

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NATURAL GAS CONSULTANTS

Cities Service 25-Year Commitment Plan Dropped

Cities Service Gas Co.'s new rate schedules which would require The Gas Service Co., Kansas City Gas Co. and The Wyandotte County Gas Co. to take their entire gas requirements without exception for a period of 25 years and for five-year periods thereafter have been suspended in a recent FPC order.

Although the new schedule did not propose any rate change, the conditions imposed were deemed unnecessary to the continuation of adequate service, unlawful, inconsistent with the public interest, and unduly burdening upon the companies involved as well as upon ultimate consumers. The old rates which will remain in effect are subject to cancellation if and when the purchasers can obtain gas at a lower price.

Cities Service maintains that the 25-year commitments are necessary to justify its construction program for the next four years.

Phillips Chemical Dept. Opens Two New Offices

The opening of two new district offices of the Philgas wholesale division of the Chemical Products Department in Kansas City, Mo., and Atlanta, Ga., has been announced by Frank Phillips, chairman and K. S. Adams, president of the Phillips Petroleum Co. The increased use of Phillips propane and butane in these areas, and the desire to work more closely with distributors prompted the opening of these new offices.

The Kansas City office will be under the supervision of H. C. Dickinson, district manager for the territory covering portions of Kansas and Nebraska and western Missouri. The Atlanta office is under the direction of A. R. Padgett, acting district manager of the territory which includes Alabama, Georgia, South Carolina, and Florida.

FPC Authorizes Purchase Of Cabot Properties

New York State Natural Gas Corp., New York City, has been authorized by the Federal Power Commission to purchase for $799,998 in cash all properties and facilities in New York and Pennsylvania owned by Godfrey L. Cabot, Inc., and Cabot Gas Corp., with the exception of production properties known as the "Wharton properties" and certain distribution facilities in New York State. The company is also authorized to sell gas to the former customers of Cabot.

New York State Natural has signed or is negotiating new contracts to the customers at a uniform rate of 43 cents per Mcf in contract to the varying rate for the gas delivered by the Cabot companies.

Cooking Classes for Girls

Weekly cooking classes are being offered this summer by the Southern Counties home service department in San Pedro, Calif., as a part of the Y. W.C.A. "stay-at-home" camp program. Eighty-eight girls ranging from eight to 14 years of age have been attending. Classes are being held at Red Cross Headquarters, and subject matter of the "modified nutrition course" is being covered in the series.

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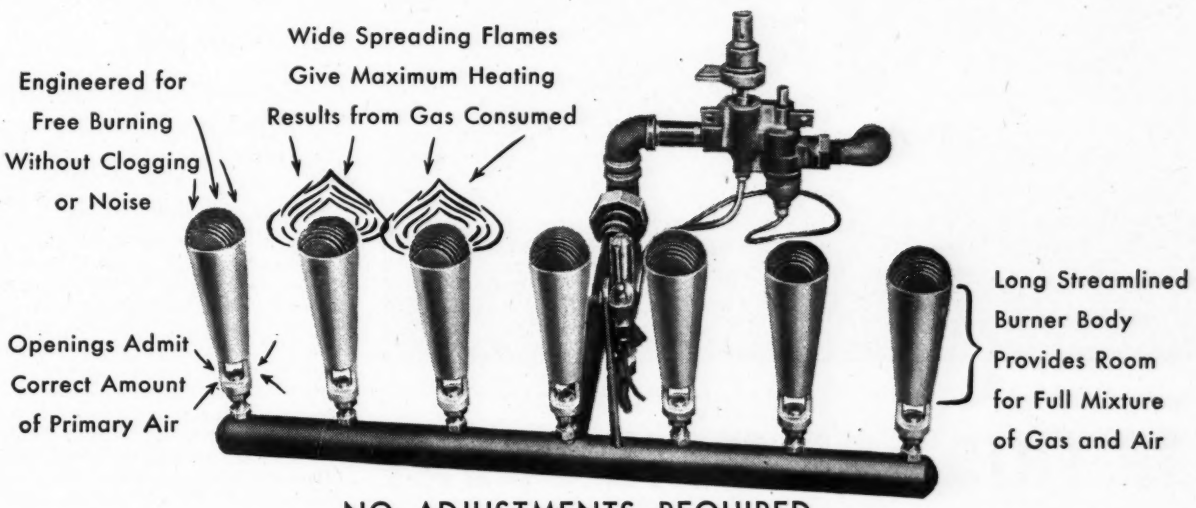
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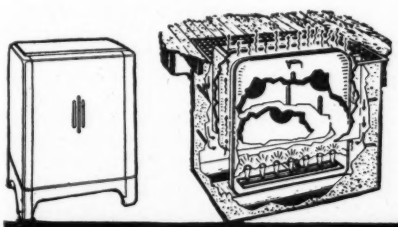

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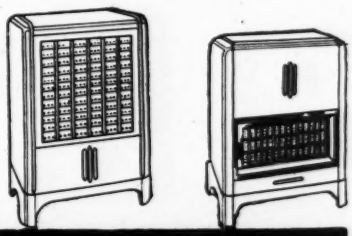

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STREET CITY ZONE STATE

Canadian City Surveying For New Gas Reserves

A Tulsa, Okla., company, C. H. Frost Gravimetrical Survey Inc., is conducting a survey of approximately 75 square miles of Albert county in the Canadian province of New Brunswick in a search for new gas reserves to supply the city of Moncton.

Hiring of the Frost company was one of the first steps to follow the signing late in July of a three-cornered agreement involving the city and the producing and distributing companies—New Brunswick Oilfields Ltd., and the Moncton Electricity and Gas Co., Ltd., respectively.

Under the agreement, the producing company is pledged to spend $88,000 annually for the development of gas fields. Funds derived from an increase in rates to Moncton consumers also are to be devoted to development work. Moncton taxpayers, in a plebiscite last April, agreed to the boost from 50 cents per Mcf to 70 cents. The distributing company is to collect the additional charge and turn it over to New Brunswick Oilfields Ltd.

Cooking Course Conducted By Pittsburgh Utility

A 14-hour basic course in cooking recently was conducted by Miss Camille Caldara, who is in charge of home service activities for the Hilltop district of the Manufacturers Light and Heat Co., Pittsburgh. The course consisted of basic instruction in the preparation of beverages, salads, vegetables, meats, poultry, eggs and desserts. Proper storage of food and operation of equipment was included. Special attention was devoted to the use of the Servel gas refrigerator for food preservation and for the preparation of frozen foods.

Fifty-two of the original 68 students attended every session and completed the course. Miss Caldara was assisted by Miss Flora Dowler, home service director for the company.

Natural Gas Odorizing Co. Now Part of New Firm

Charles E. Gill has announced the formation of the Natural Gas Odorizing Co., Inc., which has taken over the assets of the Natural Gas Odorizing Co., and the Petroleum Chemicals Manufacturing Co. and will operate the facilities of both. The new firm will continue to supply the gas industry with the products and service that have been given by the Natural Gas Odorizing Co. since its inception in 1942.

Officers of the new company are Charles E. Gill, president; John C. Worth, vice president and treasurer; and Howard W. Anderson, secretary. The plant and general offices are located at 7620 Wallisville Road, Houston.

New Boise Plant Started For Linde Air Products

The Linde Air Products Co., a unit of Union Carbide & Carbon Corp., has constructed a new oxygen cylinder filling station and Prest-O-Lite acetylene-producing plant at Boise, Idaho. The new facilities, which will be completed late this year, will provide a convenient location for supplying oxygen and acetylene to industries in the area.

FPC Lifts Restrictions on Pittsburgh Concern's Sales

The Federal Power Commission announced Aug. 11 that a new order removing limitations on sales of natural gas in New York and Pennsylvania, had been granted in favor of New York State Natural Gas Corp., Pittsburgh, Pa. The restrictions were placed upon the company in 1944 and limited the number of customers and amounts of gas which could be delivered to them.

This new order also lifted restrictions applying to sales of natural gas by Hope Natural Gas Co., United Fuel Gas Co., the Manufacturers Light & Heat Co., and the Home Gas Co., to supply areas in northern Pennsylvania and western New York.

New York State Natural's present customer companies which the order affects include New York State Electric and Gas Corp., Central New York Power Corp., Empire Gas and Fuel Co., North Penn. Gas Co. and Alleghany Gas Co., Penn-York Natural Gas Co., and Dempseytown Gas Co. New customers proposed to be served include United Natural Gas Co., Hanley and Bird, and those to be added upon acquisition by New York State Natural of the property of Godfrey L. Cabot, Inc. and Cabot Gas Corp.

CG&E to Erect Propane-Air Plant for Stacey-Dresser

Award of a contract from the Cincinnati Gas & Electric Co. to handle the engineering and supervision of erecting what will be the fourth largest propane-air plant in the gas utility industry has been announced by E. A. Flaschar, general manager of Stacey-Dresser Engineering, a division of Stacey Bros. Gas Construction Co.

Similar Stacey - Dresser propane - air plants now in the process of erection include the five largest installations in the country and will serve the gas utilities in Columbus, Detroit, Toledo, Boston and Binghamton.

Kansas Commission Asks Gas Production Figures

The Kansas Corporation Commission, following a hearing last month, asked the Republic Natural Gas Co., Dallas, to furnish figures on 88 of its gas wells on or before Sept. 1.

The hearing inquired into the alleged practice of failing to measure natural gas produced from a well and run into a pipe line. Dr. Byron B. Boatright, Houston, stated that the Kansas law does not require that gas be accurately metered. The assistant counsel for the Kansas Commission quoted from a basic commission order which requires that "meters of approved type" shall be used in accurately measuring the gas.

Southern Natural Gas Co. Files 11% Rate Reduction

Southern Natural Gas Co., Birmingham, will reduce its rates for interstate sales of natural gas by $1,211,946 (11%) annually in accordance with new rate schedules accepted by the Federal Power Commission in a recent order.

The reductions are made in compliance with an FPC order of March 30, in which Southern Natural was ordered to effect reduction of not less than $1.2 million annually, effective May 1, 1946.

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If you want to convert your small city Gas Plant Operations to Liquefied Petroleum Gas, you will have Greater Operating Profits. Many operators, in increasing numbers, are experiencing more dependable and profitable service because of substantial reduction in plant operating costs.

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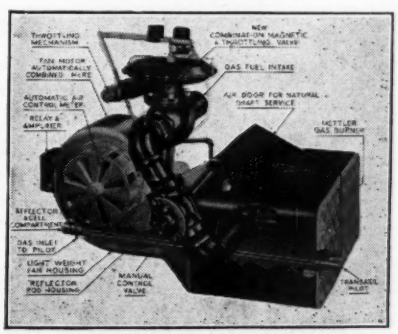

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CURRENT READING

THE FOLLOWING papers were presented at the 39th Annual Convention, Canadian Gas Association, Murray Bay, Quebec, June 18-21, 1946.

An Apparatus for the Determination of Organic Sulphur Compounds in Manufactured Gas—I. J. W. MacHattie and N. L. McNiven. This article describes an apparatus which was designed for the simultaneous determination of the known organic sulphur compounds in coal gas and carburetted water gas at the plants of The Consumers' Gas Co., Toronto. The design and arrangement of the units, together with the method of operation, are believed to simplify a complicated procedure without unduly sacrificing accuracy.

Some Problems in Gas Utilization—H. D. Lehman. A general discussion to urge continued recognition of the importance of gas pilots and other small flows to the public and the gas industry, and to encourage the carrying along of all necessary steps to insure their continuous satisfactory performance.

Some Experiences With Gas House Heating in a Canadian City—P. W. Geldard. This paper tells the story of one company's (Consumers' Gas Co., Toronto) experience with house heating. It outlines the technique used, the organization set up, and the headaches encountered.

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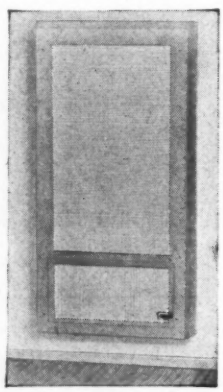

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Factors of Gas Industry Progress—Hall M. Henry. This discussion of industry progress outlines the fundamental position of gas companies as purveyors of fuel; why gas is an ideal fuel; advancements made in consumer acceptance, production, and commercial and industrial phases; steps which have been taken to keep the industry in the forefront; and a summarization of the industry's progress and growing assets.

Thermal Conductivity of Insulating Materials—National Bureau of Standards. The American Society of Heating and Ventilating Engineers has announced a program to provide more accurate and dependable values of thermal conductivity of insulating materials. Laboratories which meet the Society's requirements will be certified for testing thermal insulating materials under the program. Inquiries should be addressed to the ASHVE Research Laboratory, 7218 Euclid Ave., Cleveland 3, Ohio.

Improved Apparatus and Procedure for the Determination of Helium in Natural Gas—E. M. Frost, Jr. This Bureau of Mines report describes a new apparatus which has been devised for quickly and precisely analyzing natural gas for its helium content. Three advantages are claimed to make it far superior to any equipment now available for the purpose: (1) It enables more rapid determinations to be made. (2) It has far greater sensitivity than previous apparatus. (3) It is portable. The report is available from the Bureau of Mines.

Single-Point Ignition of Broiler and Bake Ovens—John G. Bennett. This report was delivered at the 1946 annual meeting of the Pennsylvania Gas Association. Mr. Bennett, design and test engineer at Caloric Gas Stove Works, Philadelphia, discusses the operation, advantages and growing interest in single-point ignition.

Thermal and Physical Properties of Various Materials—C. C. Eeles, R. L. Lang and M. E. Shriner, all of The Ohio Fuel Gas Co., Toledo. A.G.A. Information Letter No. 7 presents this report to aid industrial gas engineers in determining the amount of gas necessary to heat various materials and the expansion brought about through heat application. The report is accompanied by three comprehensive tables which provide the majority of the thermal and physical properties required for such calculations.

Electronics Improves Industrial Process Control—D. M. Considine and D. P. Eckman. "Chemical Industries," May, 1946. pp 785-787. Part 1—Electronic potentiometers and X-ray spectrometry. Operation of today's complex chemical processing operations would be extremely difficult, if not impossible, without precise reliable instrumentation. In this article the operation and applications of the electronic potentiometer and the Geiger-Counter X-ray spectrometer are described.

Texas-California Gas Line to Prevent Much Waste—P. Kayser. "Oil Weekly," June 24, 1946, pp. 98, etc. Route of the Texas-California natural gas pipe line is shown on a map. El Paso Natural Gas Co. will construct that portion shown as a solid line, while Southern California Gas Co. and Southern Counties Gas Co. will jointly build that part shown as a dotted line which will be 214 miles of 30-inch pipe. The El Paso company will build 737 miles of 26-inch line from near Eunice, in Lea County, New Mexico, to a point on the Arizona-California boundary near Blythe, Calif.; 251 miles of 24-inch line from near Dumas in the Texas Panhandle, to Eunice; and several lateral gathering systems in West Texas. To operate at the ultimate capacity of 305 million cubic feet daily will require 131,800 hp in field and six main line compressor stations on the El Paso company's portion of the line alone.

High-Pressure Gas-Well Corrosion Caused by CO_2, H_2S, and Fatty Acids, N.G.A.A. Committee Study Discloses—T. S. Bacon. "Oil and Gas Journal," May 4, 1946, pp. 119, etc. Three fatty acids. formic, acetic, and propionic, have been found in gas wells which show corrosion. In wells producing from formations 5000 ft. deep or more, at 1500 psig. or higher, at 160° F. or higher and with carbon dioxide at 0.2% concentration or more, corrosion will appear. Carbonic acid ($CO_2 + H_2O$) under well-head conditions has shown 0.03 in. per year penetration into casing or tubing wall. Stainless and other high-alloy steels such as 18-8 show promise in reducing corrosion in gas wells. Sodium chromate shows good results as an inhibitor.

Absorption Plant Saves 30 Million Feet of Gas—"World Petroleum," June, 1946, pp. 60, 62. Designed specifically for the purpose of collecting flare gas from almost 200 oil and gas wells located on 85 leases in the area, the Glen H. McCarthy gasoline absorption plant in Winne, Jefferson County, Texas, was opened officially in March of this year. The plant and its operation are described. Illustrated.

Report on Hydrocarbon Research—U. S. Dept. of Commerce, National Bureau of Standards. A report on the status of tables of physical and thermodynamic properties of hydrocarbons and catalogs of infrared and ultraviolet spectrograms, as of Jan. 31, 1946, issued by American Petroleum Research Project 44, a cooperative activity maintained by the Institute at the Bureau of Standards and at the University of California.

Combating Corrosion—D. P. Thornton, Jr. "National Petroleum News," June 5, 1946, pp. R-450, etc. New techniques for protection of pipe lines and buried structures presented before the convention of Corrosion Engineers Society.

Protecting Underground Pipe Lines—J. C. Stirling. "Oil Weekly," June 24, 1946, pp. 64, etc. Successful methods for economically combating external corrosion of underground pipe lines are discussed.

Aerial Patrol Pipe Line Practice—G. Romans. "Oil Weekly," June 24, 1946, pp. 85, etc.

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Non-Destructive Testing of Refinery Equipment—C. D. Havens. "Petroleum Engineer," June, 1946, pp. 92, 95, 96. Two methods are now being used in many refineries to inspect equipment at regular intervals: the Magnetic Particle inspection method and the Fluorescent Penetrant inspection method. In applying the first method, a suitable magnetic field is created in the part under test, and very finely divided ferromagnetic particles are dusted or blown over the surface of the part. The second method consists of applying a liquid penetrant containing a material that fluoresces with a brilliant light when exposed to the rays of the so-called "black light."

New Glycol Dehydration Plant Reduces Gas Dew Point 50°—"National Petroleum News," June 5, 1946, pp. R-421, 422. The Agua Dulce, Texas, diethylene glycol gas dehydration plant of Tennessee Gas and Transmission Co., has three contactors which together can handle a maximum of 300 MMcf of gas per 24 hours at a working pressure of 840 psig and reduce the dew point approximately 50° F. In January and February the plant removed an average of better than 28 lbs. of water from every million cubic feet of gas handled. This represents more than 1000 gals. per calendar day. Operation of the plant is briefly described.

Germany's Fischer-Tropsch Process—E. Cotton. "National Petroleum News," June 5, 1946, pp. R-425, etc. Author discusses commercial methods of preparing and purifying the synthesis gas, manufacture of the catalyst, type of reactors employed, the actual synthesis procedure and the products obtained. Also covered are the iron-type catalysts which were under development and which, because they promote yields of higher-octane gasoline, are of most interest in this country.

1945-46 Year Book of the American Standards Association.—Contains information about the setup of the ASA and how standards are developed. A section is devoted to listing approved American standards and projects under development, together with the scopes of these projects and names of officers and members of active technical committees. Free copies are available from the American Standards Association, 70 East 45th St., New York 17, N.Y.

Depleted Sands Provide Floating Gas Storage—N. Williams. "Oil and Gas Journal," June 1, 1946, pp. 58, 59, 75. Fields operated by Sinclair Wyoming Oil Co., in its Lost Soldier, Wyoming, district are linked by a common gas system designed to insure the most efficient and conservative distribution and utilization of their respective available production.

Pipe-Liners Lick Tough River Crossing—R. L. Buck. "Oil Weekly," June 24, 1946, pp. 126, 127. Describes and illustrates the Cumberland River pipe line crossing of the Tennessee Gas and Transmission Co.'s 24-inch natural gas line.

Super-Expansibility of Methane-Ethane Mixtures—W. O. Clinedinst. "Petroleum Refiner," June, 1946, pp. 148, 149.

Catalogs

• **Roots-Connersville Blower Corp., Connersville, Ind.**—Bulletin 22:23-B-12 describes rotary positive blowers. It covers the many applications for this type of blower including: activated sewage disposal plants, supercharging and scavenging of diesel engines, chemical process industries, pneumatic conveying service, tunnel ventilation, mining and smelting, oil refining processes, foundry cupola service, water gas blowing, steel mills and coke oven plants, various combustion processes, coal treatment, grain conditioning, food industries, yarn drying, and vacuum filtration processes.

• **Roberts & Mander Corp., Hatboro, Pa.**—A full-color catalog illustrates and describes the entire Quality steel kitchen cabinet line. The center spread shows an ideal modern kitchen with each feature numbered, and an accompanying guide explains the features. A complete installation manual, which gives simple instructions for proper installation, and helpful hints in planning and laying out the modern kitchen, is also available.

• **Surface Combustion Corp., Toledo 1, Ohio**—Hardening in Surface Combustion standard rated furnaces is described in a 4-page bulletin No. SC-131. The bulletin gives a resume of hardening practices and shows a photo micrograph of steel in the spheroidized and in the hardened state. Ideal furnaces for various methods of hardening are illustrated, and a table giving Ms points for some steels is included.

• **Gas Processes Division of The Gridler Corp., Louisville, Ky.**—A new 32-page booklet containing numerous pictures, flow diagrams and tables reviews the commercially useful methods of producing hydrogen. A description of the Gridler hygirtol plant for production of high purity hydrogen by reacting hydrocarbons with steam is included. The comprehensive table of contents indicates complete coverage of the topic.

• **The Cooper-Bessemer Corp., Mount Vernon, Ohio**—Bulletin No. 338 introduces the type GMX compressor unit, which contains many of the proved design features of the GMV. The attractive 18-page bulletin is profusely illustrated. Bulletin No. L-51 is one of a series of four-page folders covering the company's line of stationary and marine diesels, gas diesels and gas engines.

• **American Standards Association, 70 East 45th St., New York 17, N.Y.**—This revised list of approved standards is available free of charge. The 845 standards listed include definitions of technical terms, specifications for metals and other materials, dimensions, safety provisions for the use of machinery, methods of work and methods of test for the finished product.

• **Ingersoll-Rand Co., Phillipsburg, N.J.**—"Process Pumps" is a new 12-page, illustrated bulletin which describes the company's line of single-stage pumps built for general service in the refinery, process, coke by-products and related industries.

June Gas Sales Totals Up; 12-Month Figures Drop 4%

According to a report made by the American Gas Association, sales of gas by utility companies for residential and commercial use, in accordance with an apparent long-term trend, increased in June. Increases in residential gas sales were reported in each of the three categories of manufactured, mixed and natural gas for the month.

Decline in sales of industrial gas offset residential and commercial gas sales increases, and the total sales of gas utility companies for June amounted to 1,942 million therms, a decrease of about 4.4% from sales for June, 1945. For the 12 months ended June 30, 1946, total sales of utility gas to ultimate consumers, excluding sales to other utilities, aggregated 25,683 million therms, a decline of about 1.8% compared with the like period a year ago.

The American Gas Association is now developing separate information pertaining to mixed gas. These data were formerly included either in the manufactured or the natural gas series.

Michigan Consolidated Case To Be Reheard Sept. 9

The Federal Power Commission has announced an order postponing from August 22 to September 9 the hearing set for reconsideration of an FPC order of October 31, 1945, under which Michigan Consolidated Gas Company, Detroit, was classified as a "natural-gas company" within the meaning of the Natural Gas Act. The hearing will commence at 10 A.M. (EST) in the commission's hearing room, Washington, D.C.

The hearing was set in response to an application for rehearing by the company, which denies that it should be subject to Commission jurisdiction.

Price Increases Announced By Standard of California

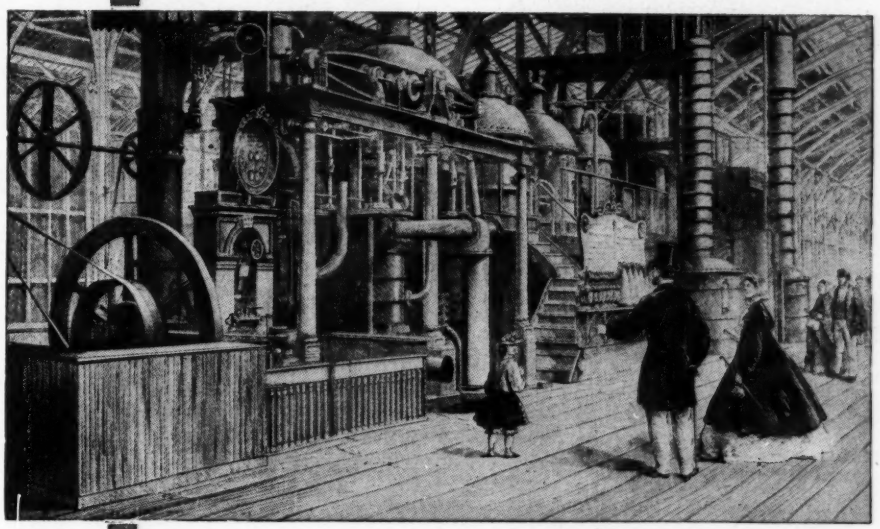
Standard of California recently announced new posted prices, reflecting higher costs in the production of crude oil, which until a short time ago have had to be almost totally absorbed by oil producers because of OPA regulations. As of Aug. 1 Standard is paying from 10 to 30 cents a barrel more for purchases of crude oil and an average of 1 cent a gallon more for natural gasoline.

Gasoline, kerosene, thinners, solvents, and liquefied gases have increased 1 cent a gallon, but industrial fuel oils remain unchanged in price.

FPC Authorizes Amortization

Northern States Power Co., Minneapolis, Minn., has been authorized by the FPC to amortize over a five-year period $1,811,895 of premiums and expenses involved in exchange and redemption of 275,000 shares of $5 cumulative preferred stock valued at $100 per share, instead of being required to write off the amount immediately. Northern States proposes to refund the stock now outstanding by issuing an equal number of shares of preferred stock, without par value.

The company has also been authorized by FPC to make accounting adjustments involving elimination of approximately $31.8 million from its utility accounts as of Dec. 31, 1944.



Famous Facts

Wide interest was attracted by the elaborate Sugar Refining Apparatus displayed by Messrs. Caile and Company at the London International Exhibition in 1862. Such exhibits helped immeasurably to raise the standard of living through the promotion of the industrial arts.

At the same time, Bitumastic Enamel — the first product of its kind — was attracting notice for its performance in preventing corrosion of the internal surfaces of steel ships. It has continued to display its superiority as a protective coating for pipe lines and other underground and underwater metal surfaces in industry throughout the world.

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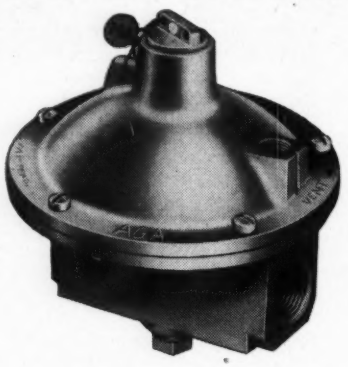

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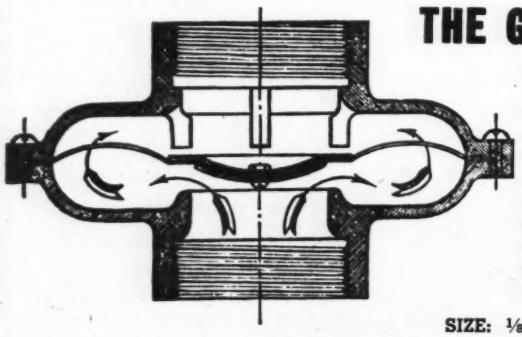

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Propane to Replace Coke In Canadian City Urged

In an interim report made Aug. 10 to the Public Utilities Commission in Owen Sound, Ontario, Can., Consulting Engineer D. H. Thorburn recommended that immediate consideration should be given to the establishment of a propane gas plant to replace the present coke oven gas plant.

Thorburn reported that it should be possible for the commission, upon commencement of operation of such a plant, to announce to consumers an immediate reduction of not less than 15% in rates. He added further that at the end of the first year it should be possible to pass on another reduction.

The plant would have a minimum of 30 days storage and could be enlarged to 60 or 90 days storage for an additional $9000 and $17,000 respectively, Thorburn said.

"All present conventional methods of gas production studied by us, when applied to present conditions at Owen Sound, resulted in a higher cost per Mcf at the consumer's meter than the liquid petroleum gas."

United Gas & Fuel Plans Rate Boost in Hamilton

T. Pates Pinckard, general manager, United Gas & Fuel Co., Ltd., Hamilton, Ontario, Can., appeared before the city's Board of Control on Aug. 13 to make known the fact that the company planned eventually to increase the cost of manufactured gas to its domestic consumers.

Pinckard said that the new rate would be substantially lower than that authorized by by-law—$1.25 per Mcf. The present rate is 75 cents per 1000 cubic feet. He added that the new rates were estimated to convert a present loss into an annual gain of $75,000.

Portland Gas & Coke Co. Announces Medical Plan

The Portland Gas & Coke Co. has announced a new family medical plan for their employees to be effective as soon as a quota of the organization members subscribe for medical and hospital benefits under the Oregon Physician's Service.

This new plan for families will cover surgical and hospital expense, including fractures. Like the individual coverage, the family plan also provides for specialists if deemed necessary. Prenatal and obstetrical care, including hospitalization, are also covered with certain limitations.

The OPC is the pre-paid medical program sponsored and approved by the Oregon State Medical Society.

Alabama Wells Expected To Supply State's Demands

State Geologist Walter B. Jones of Alabama recently stated that Winston and Walker counties show promise of becoming the state's greatest natural gas producing areas. Dr. Jones predicted that because of the increased cost of coal, Alabama citizens will use gas for heating this winter to a large extent. At present most of the gas used in the state is piped from Texas, Louisiana and Mississippi, but it is hoped that wells within the state soon will supply most of the demand.

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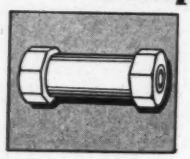

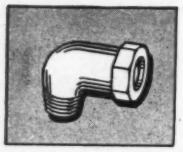

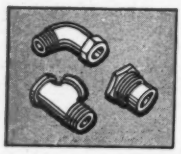

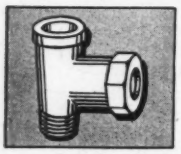

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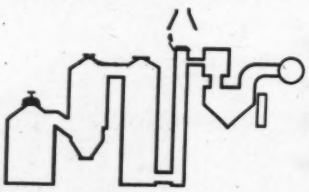

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FPC Sets Panhandle Rate Schedule Hearing Dates

The Federal Power Commission issued an order Aug. 6, setting a hearing for Sept. 16, on terms and conditions of service embodied in the revised rate schedules filed by Panhandle Eastern Pipe Line Co. The commission has received complaints from customers of Panhandle regarding interruptions of service, and the hearing has been set in order to secure evidence on all matters relating to the reasonableness and adequacy of the terms and conditions of service included in the rate schedules, and on proposed changes or additions to existing practices relating to such service.

The Federal Power Commission postponed from Aug. 26 to Sept. 30 reconsideration of an FPC order of Mar. 14, 1946, which dismissed without prejudice an application of Panhandle Eastern Pipe Line Co. for permission to supply natural gas to the Ford Motor Co., Dearborn, Mich.

The order of Mar. 14 was issued concurrently with the commission's opinion No. 130, which held that the proposed sale of gas to the Ford Co. would impair gas service to Panhandle's present customers and was against the public interest. Panhandle's application for reconsideration, filed Apr. 15, requested that the order be abrogated, modified by dismission of the application for want of jurisdiction, or that a rehearing be granted.

Australian Gas Engineers Complete A.G.A. Lab Study

Three Australian gas engineers have completed a two-week technical study of testing and research techniques at the American Gas Association Testing Laboratories in Cleveland.

In the United States for the purpose of surveying American methods and technical procedures, the visitors are all executives of the Australian Gas Light Co. They are W. J. D. Palmer, assistant research officer; F. S. P. Harper, assistant supervisor, Service Division; and G. A. Peterson, industrial gas engineer.

During their stay here the men are visiting a number of leading utility companies and equipment manufacturers and consulting members of the association's headquarters staff who have assisted them in arranging their itinerary. The Australian gas industry organized a testing laboratory in that country several years prior to the war which was established on lines similar to our own.

Survey Shows Increase in Electric Light Users

Edison Electric Institute has announced that a survey made during the six months ending June 30 shows the addition of 800,000 new residential customers in the electric light and power industry. Projection of this rate of gain throughout the year would indicate 1.6 million new customers in 1946.

Communities with a population of 2500 or more, in which 70% of the nation's residential users are now located, accounted for only one-fourth of the additions. About 100,000 customers a month are being added in small rural areas. Most of the gains have taken place in the South.